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Conducta autolesiva no suicida en adolescentes. Factores relacionados con el seguimiento en salud mental y aplicación de la evaluación ecológica momentánea.

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Conducta autolesiva no suicida en adolescentes. Factores relacionados con el seguimiento en salud mental y aplicación de la evaluación ecológica momentánea.

El siguiente trabajo por compendio de artículos, profundiza en la evaluación y seguimiento de la conducta autolesiva no suicida (NSSI). Está conducta tiene una alta prevalencia tanto en muestras no clínicas como en muestras clínicas, y a pesar de que los estudios sobre la conceptualización y desarrollo de esta conducta han aumentado en los últimos años, aún son necesarios más estudios sobre evaluación, evolución y seguimiento de estos pacientes en la clínica. La Evaluación Ecológica Momentánea (EMA) es un sistema que se presenta como una buena alternativa para este objetivo, muy adecuada en nuestra situación actual de pandemia, donde la asistencia no presencial ha cobrado un papel muy importante.

En el primer artículo presentado en el que se estudiaron características clínicas de pacientes con NSSI y factores clínicos relacionados con la persistencia o el abandono del tratamiento de salud mental entre la adolescencia y la edad adulta, se encontraron diferencias estadísticamente significativas en los pacientes con historia de NSSI en los problemas de conducta (más problemas de conducta en el grupo que abandona el tratamiento) ($t = 2.121$; $p < 0.01$) y en la conducta prosocial (mayor puntuación en la conducta prosocial en el grupo que mantiene el tratamiento) ($t = -2.086$; $p < 0.05$). Tras realizar un análisis de regresión, sólo la conducta prosocial permaneció en el modelo como predictor de mantenimiento de seguimiento.

En el segundo artículo presentado (revisión sistemática sobre el uso de EMA en NSSI) se analizaron 23 estudios. Del análisis de datos se desprende una carencia de estudios en muestras clínicas y de adolescentes, y de protocolos a largo plazo.

En el tercer artículo presentado en el que se estudió la relación entre distintas variables clínicas y sociodemográficas, y el uso de un protocolo EMA en una muestra clínica de 209 pacientes, se encontró que la historia de NSSI era un predictor del uso de EMA.

A partir de los resultados podemos concluir que el abandono del seguimiento en la edad adulta de pacientes con historia de NSSI se puede evitar trabajando factores relacionados con el vínculo como la conducta prosocial. Además la evaluación y el seguimiento de estos pacientes en la práctica clínica también pueden mejorar con la aplicación de EMA, que se ha mostrado como una estrategia con buena aceptación y con posibilidades interesantes para mejorar la evaluación y la adherencia al tratamiento en salud mental de esta población.

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INDICE

1. INTRODUCCIÓN

1.1. INTRODUCCIÓN GENERAL DEL COMPENDIO DE TRABAJOS

1.1.1. La conducta autolesiva no suicida y su evolución

La conducta autolesiva no suicida, o Non-Suicidal Self Injury (NSSI), se define como la destrucción directa y deliberada del propio tejido corporal sin intención suicida (Nock, 2009). La conducta autolesiva no suicida es considerada un problema de salud pública (Glenn et al., 2017) que implica una carga financiera sustancial para la sociedad (Hauber et al., 2019). Está relacionada con problemas graves en la edad adulta, como los trastornos de la personalidad (Groschwitz et al., 2015) y el suicidio (Groschwitz et al., 2015; Whitlock et al., 2006), por lo que la falta de detección y tratamiento de NSSI puede suponer un coste personal y social significativo.

El inicio de NSSI se produce típicamente durante la adolescencia (Cipriano et al, 2017; Klonsky et al., 2014; Muhlenkamp y Gutiérrez, 2007) y éste a su vez es el periodo evolutivo de mayor prevalencia (Muehlenkamp et al., 2012). La prevalencia de NSSI en muestras comunitarias es superior al 17,2% en los adolescentes, al 13,4% en adultos jóvenes y al 5,5% en adultos (Swannell et al., 2014). Los estudios en muestras clínicas son más escasos y generalmente tienen en cuenta muestras de pacientes hospitalizados en psiquiatría donde la prevalencia es de aproximadamente el triple (Olfson et al., 2005). Los estudios en muestras clínicas ambulatorias son poco comunes, pero son necesarios debido a la frecuencia y a los desafíos que supone esta conducta en el seguimiento en salud mental. En nuestro país sólo encontramos un estudio en pacientes adolescentes en

seguimiento en salud mental en el que se reportó una prevalencia en torno al 22% (Díaz de Neira, 2014).

NSSI en adolescentes se ha relacionado con varios factores de riesgo en estudios longitudinales, como los trastornos depresivos (Aglan et al., 2008; Hankin y Abela, 2011; Wilkinson et al., 2011), eventos vitales estresantes y disfunción familiar (Aglan et al., 2008), antecedentes de NSSI (Asarnow et al., 2011; Wichstrom, 2009; Wilkinson et al., 2011), antecedentes de intentos de suicidio, orientación no heterosexual, ideas de suicidio y problemas de conducta (Wichstrom, 2009), ser mujer (Wichstrom, 2009; Wilkinson et al., 2011), estilo cognitivo negativo y ausencia de apoyo social (Hankin et al., 2011). Aunque se han descrito varios factores relacionados con esta conducta, apenas existen estudios que realicen un seguimiento continuado de estos pacientes. A pesar del aumento de estudios en los últimos años relacionados con la caracterización clínica de los adolescentes que presentan NSSI en la adolescencia, la información sobre la evolución clínica no está bien documentada y da lugar a más preguntas que respuestas (Whitlock y Selekman, 2014).

En los últimos diez años ha habido una proliferación de estudios longitudinales sobre NSSI aunque estos todavía son deficientes. La mayoría de ellos consideran periodos de seguimiento a corto plazo y no contemplan diferencias entre distintas etapas evolutivas. Por otro lado, los estudios realizados con muestras clínicas son muy escasos (Glenn et al., 2017; Groschwitz et al., 2015; Prinsten et al., 2010). Por lo general, los estudios están centrados en determinar qué factores predicen longitudinalmente la persistencia en el tiempo de la conducta autolesiva no suicida, sin embargo no tienen en cuenta otros factores relacionados con el seguimiento clínico del paciente a excepción del estudio de

Groschwitz et al. (2015). En este estudio se recogieron datos de 52 antiguos pacientes adolescentes con al menos un episodio de NSSI, que tenían entre 18 y 30 años de edad en el momento del estudio. Comprobaron que, si bien la prevalencia de NSSI puede disminuir con el tiempo, la psicopatología tiende a prevalecer en la edad adulta. Dos tercios de los participantes aún cumplían en la edad adulta los criterios de un trastorno psiquiátrico del eje I y el 61,5% de los participantes cumplían los criterios para un trastorno del eje II. No obstante, el 54% de todos los participantes informaron de que no recibían ningún tratamiento de salud mental. Además, encontraron que el inicio temprano de NSSI era un factor de riesgo para el Trastorno Límite de la Personalidad en adultos y que la aparición de pensamientos y conductas suicidas y los antecedentes de NSSI estaban altamente asociados.

Hasta donde sabemos, ningún estudio se ha centrado en estudiar factores relacionados con la continuidad o el abandono del seguimiento en salud mental de estos pacientes. Es importante comprender qué factores se relacionan con la continuidad o el abandono del tratamiento de salud mental desde la adolescencia hasta la edad adulta joven, ya que un alto porcentaje de los adolescentes con NSSI continúan con problemas de salud mental durante su vida adulta (Groschwitz et al., 2015). Además, la detección de estos factores podría ayudar a los clínicos a diseñar estrategias para mejorar la adherencia al tratamiento.

1.1.2. La evaluación ecológica momentánea y la conducta autolesiva no suicida.

La evaluación de NSSI y sus variables relacionadas, tanto en la clínica como en los estudios de investigación transversales y longitudinales, se realiza generalmente de forma retrospectiva. Esto implica, aparte de los sesgos de memoria, una dificultad para entender qué factores están involucrados en el mantenimiento, cese o agravamiento de esta conducta y para conocer la evolución de los pacientes. La evaluación ecológica momentánea o Ecological Momentary Assessment (EMA) nos permite tratar estas dificultades ya que nos posibilita tener registro de ciertas conductas, síntomas y estados del sujeto, detectados o registrados por el sujeto en "tiempo real" y en entornos "de su vida cotidiana" dando lugar a una mayor precisión en la recogida de datos. EMA no es un método único, ni una tecnología particular, sino una colección de métodos que comparten las características más arriba descritas (Shiffman et al., 2008).

La EMA por tanto, permite la evaluación no presencial del paciente, algo que en el momento actual de pandemia por COVID-19 cobra especial relevancia. Esta situación nos ha obligado a transformar parte de nuestra actividad en salud mental en no presencial, por lo que EMA se presenta como una herramienta clave y de implantación necesaria.

La forma en que se programan las evaluaciones EMA puede ser diferente según el objetivo del estudio. Las evaluaciones pueden estar vinculadas a eventos, como las ocasiones en que el sujeto está a punto de realizar o acaba de realizar una conducta concreta (como un episodio de NSSI), lo que se conoce como *evaluaciones*

contingentes a eventos. Otro enfoque para programar EMA consiste en planificar las evaluaciones para determinados momentos prefijados, como por ejemplo "antes de acostarse", o bien planificarla por intervalos específicos de tiempo "cada tres horas". Esto se conoce como *evaluaciones contingentes a un intervalo de tiempo*. En ocasiones estos momentos se programan al azar para proporcionar una estimación representativa e imparcial del estado típico de los sujetos. A fin de inducir al sujeto a completar la evaluación en los momentos programados, en los estudios de EMA se suele utilizar un dispositivo que pueda mandar una señal en el momento apropiado (como por ejemplo los smartphones), lo que se conoce como *evaluaciones contingentes a señales*. Lo más común y útil en los estudios EMA es combinar las diferentes modalidades de evaluación (Shiffman, 2008., Shiffman, 2014).

Los métodos de evaluación pueden ir desde el uso de papel y lápiz hasta el uso de las tecnologías más avanzadas. Como es lógico el uso de nuevas tecnologías está sustituyendo a los métodos más convencionales como las evaluaciones de papel y lápiz (Hektner et al., 2006). Esto implica una mayor precisión y realismo de los datos ya que permiten verificar el momento en el que el sujeto realiza cada registro. Esto a su vez, permite realizar análisis sobre el cumplimiento real de la tarea de registro, ya que el incumplimiento puede ser uno de los mayores problemas de este tipo de evaluación.

En una revisión reciente sobre el cumplimiento de los protocolos de EMA móvil en niños y adolescentes se encontró un promedio de cumplimiento del 78%, sin diferencias entre las muestras clínicas y no clínicas (Wen et al., 2017). El cumplimiento promedio en esta revisión se define como subóptimo y está por debajo del cumplimiento en adultos (superior al 80%) hallado en otros estudios de revisión (Cain et al., 2009). En la revisión

llevada a cabo en muestras adolescentes (Wen et al., 2017) se analizaron los factores del diseño de EMA relacionados con un mayor o menor el cumplimiento, pero apenas se examinaron los factores personales y clínicos relacionados con la aceptación y el cumplimiento del mismo. No se han encontrado estudios que valoren estos factores en población infanto-juvenil, pero Barrigon et al. (2017) si lo han estudiado en población adulta. Encontraron que los usuarios activos en EMA eran más jóvenes, estaban diagnosticados con mayor frecuencia de trastornos de ansiedad, informaban con más frecuencia sobre pensamientos de muerte y suicidio, y habían experimentado más acontecimientos estresantes en su vida que los usuarios no activos.

Las conductas autolesivas no siempre se reportan durante la consulta cara a cara por motivos diversos como puede ser la vergüenza, el miedo o la falta de indagación por parte del clínico. Sin embargo, investigación reciente refiere que los jóvenes que se autolesionan hacen más uso de las nuevas tecnologías y tienden a utilizarlas como medio para comunicarse y buscar apoyo social (Memon et al., 2018). Teniendo en cuenta estos datos y los obtenidos en el estudio de adultos de Barrigón et al. (2017) en el que se refiere que los usuarios activos de EMA tienden a informar más frecuentemente sobre pensamientos autolesivos que los no activos, cabe pensar que EMA puede ser una herramienta con potencial para el seguimiento e incluso la adherencia psicoterapéutica de pacientes con NSSI.

1.2. JUSTIFICACIÓN Y OBJETIVOS

Sabemos que un alto porcentaje de los adolescentes con NSSI mantienen problemas de salud mental durante su edad adulta sin tratamiento, pero hasta donde conocemos no hay estudios sobre el seguimiento clínico de los pacientes adolescentes con NSSI en relación con la persistencia o el abandono de su tratamiento en salud mental en la etapa adulta.

Por otro lado, según lo recogido en la introducción, el uso de EMA en NSSI parece una herramienta con un valor potencial tanto para el seguimiento como posiblemente para la adherencia terapéutica de estos pacientes en la práctica clínica.

El objetivo general de este trabajo es contribuir al conocimiento de la NSSI estudiando los factores relacionados con el abandono o persistencia de tratamiento en salud mental de estos pacientes entre la adolescencia y la edad adulta; recopilando la información acumulada hasta la actualidad sobre la aplicación de EMA en NSSI en adolescentes; y examinando la aceptación y viabilidad del uso de un protocolo EMA original en una muestra clínica de adolescentes.

Las aportaciones originales del doctorando consistirán en lo siguiente

1. Comparar características clínicas de pacientes que presentaron NSSI durante su adolescencia y pacientes que no, y determinar los factores sociodemográficos y clínicos relacionados con la persistencia o el abandono del tratamiento entre la

adolescencia y la edad adulta joven, en una muestra clínica de pacientes asistentes a un centro ambulatorio de salud mental.

2. Revisar la literatura existente acerca del uso de EMA en adolescentes con NSSI para clarificar las nuevas aportaciones al conocimiento de NSSI, conocer el estado actual de uso de EMA en esta conducta, y detectar deficiencias y posibles mejoras.

3. Aplicar un protocolo EMA a largo plazo en una muestra clínica de pacientes adolescentes asistentes a un centro ambulatorio de salud mental determinando su aceptación y uso atendiendo a variables clínicas y sociodemográficas.

2. METODOLOGÍA

La presente tesis doctoral consiste en la compilación de tres estudios publicados en revistas de reconocido prestigio, todas indexadas en el Journal Citation Reports (JCR) y con alto factor de impacto en el campo de la salud mental.

A continuación se detallan los estudios con su referencia completa y estado actual:

1. Estudio observacional longitudinal retrospectivo de origen clínico donde se determinan factores clínicos relacionados con la persistencia o el abandono del tratamiento de salud mental entre la adolescencia y la edad adulta, en una muestra clínica de pacientes asistentes a un centro ambulatorio de salud mental.

   Rodríguez-Blanco, L., Carballo-Belloso, J.J., De León, S., Baca-García, E (2020). A longitudinal study of adolescents engaged in NSSI: clinical follow up from adolescence to young adulthood. *Psychiatry Research*, 297.

2. Revisión sistemática acerca del uso de EMA en NSSI donde se da a conocer el estado actual del uso de EMA en NSSI y donde se clarifican las aportaciones concretas que se desprenden de estos estudios al campo de NSSI.

   Rodríguez-Blanco, L., Carballo, J.J., Baca-García, E (2018). Use of Ecological Momentary Assessment (EMA) in Non-Suicidal Self-Injury (NSSI): A Systematic Review. *Psychiatry Research*, 263, 212-219.

3. Estudio observacional transversal de origen clínico donde se estudia el uso de un protocolo EMA atendiendo a variables clínicas y sociodemográficas de los pacientes.

   Rodríguez-Blanco, L., Carballo, J.J., De León, S., Baca-García, E. (2020). User Profiles of Electronic Ecological Momentary Assessment in Outpatient Child and Adolescent Mental Health Services. *Revista de Psiquiatría y Salud Mental* (en prensa)

La metodología empleada en cada estudio se especifica en el apartado correspondiente de cada publicación incluida en el apéndice

3. RESULTADOS GENERALES

A continuación se expone un resumen global de los resultados más importantes obtenidos en los estudios. Los resultados detallados se encuentran en el apartado correspondiente de cada publicación incluida en el apéndice.

En el primer artículo presentado en el que se estudiaron características clínicas de pacientes con NSSI y factores clínicos relacionados con la persistencia o el abandono del tratamiento de salud mental entre la adolescencia y la edad adulta, se encontró una mayor ocurrencia de ideación suicida en el grupo de pacientes con historia de NSSI ($\chi 2 = 15.679$; $p < 0.001$) que en el grupo de pacientes sin historia de NSSI. Además este grupo recibió más consultas en promedio ($t = -2.077$; $p = .04$). En cuanto a los factores relacionados con el seguimiento, se encontraron diferencias estadísticamente significativas en los problemas de conducta (más problemas de conducta en el grupo que abandona el tratamiento) ($t = 2.121$; $p = 0.000$) y en la conducta prosocial (mayor puntuación en la conducta prosocial en el grupo que mantiene el tratamiento) ($t = -2.086$; $p = 0.044$). Estas diferencias sólo se dieron en el grupo de pacientes con NSSI y no en el grupo control. Tras realizar un análisis de regresión, sólo la conducta prosocial permaneció en el modelo como predictor de mantenimiento de seguimiento.

En el segundo artículo presentado (revisión sistemática sobre el uso de EMA en NSSI) se analizaron 23 estudios. Se encontró que la mayoría de ellos contemplaron un seguimiento con EMA a corto plazo y se focalizaron en el estudio de la dinámica de los afectos, confirmando la función de regulación de las emociones de NSSI. Sólo cinco de

los estudios que cumplieron los criterios de inclusión incluyeron muestra adolescente y en concreto sólo dos de ellos incluyeron en su muestra a adolescentes exclusivamente.

En el tercer artículo presentado en el que se estudió la relación entre distintas variables clínicas y sociodemográficas y el uso de un protocolo EMA en una muestra clínica de 209 pacientes, se encontró un mayor porcentaje de pacientes diagnosticados de Trastorno de Déficit de Atención con Hiperactividad (TDAH) en el grupo de usuarios no activos ($\chi 2 = 5.626$; $p = 0.018$), y un mayor porcentaje de pacientes con NSSI en el grupo de usuarios activos ($\chi 2 = 9.353$; $p = 0.002$). El análisis de regresión confirmó el valor predictivo de NSSI en el uso de EMA (usuario activo) y de TDAH en el no uso de EMA (usuario no activo)

4. DISCUSIÓN

En el primer artículo incluido en este trabajo, cuyos objetivos principales fueron estudiar las características clínicas de pacientes que presentaron NSSI durante su adolescencia, y examinar los factores relacionados con la persistencia o el abandono del tratamiento de salud mental entre la adolescencia y la edad adulta, encontramos que aunque los pacientes con NSSI recibieron un mayor número de consultas en promedio, el tiempo de seguimiento no fue diferente al de los pacientes sin historia de NSSI y más de un tercio de los pacientes (tanto con historia de NSSI como sin historia de NSSI) abandonaron el tratamiento de salud mental antes de llegar a la edad adulta joven. La elevada tasa de abandono del tratamiento de salud mental antes de la edad adulta podría estar influida por la forma en que se estructuran los servicios de salud mental, ya que al cumplir los 18 años generalmente los pacientes cambian de servicio y estas transiciones no siempre son sencillas (Broad et al., 2017; Cleverley et al., 2020). Aparte de este factor, nosotros analizamos las variables clínicas y sociodemográficas que podrían estar implicadas en este abandono, especialmente importante en los pacientes con NSSI si tenemos en cuenta su posible mala evolución en la edad adulta joven (Groschwitz et al., 2015). En general, encontramos más problemas de comportamiento en la adolescencia en los pacientes que abandonan el tratamiento y más problemas emocionales en la adolescencia en los pacientes que mantienen el tratamiento después de los 18 años. Esto es algo particular de los pacientes de NSSI que no se encontró el grupo de pacientes que no habían reportado NSSI en la adolescencia, lo que podría estar relacionado con el hecho de que los problemas conductuales y emocionales son más prominentes en los pacientes con NSSI (Díaz de Neira, 2014). También encontramos un mayor porcentaje de gestos e intentos suicidas en el grupo de pacientes con NSSI que abandonaron el tratamiento.

Aunque estas diferencias no fueron estadísticamente significativas (la muestra de pacientes con intentos y gestos suicidas fue pequeña) son interesantes ya que contrastan con los hallados en el grupo de pacientes sin NSSI en el que no encontramos estas diferencias entre los pacientes que mantuvieron y abandonaron el seguimiento. En este grupo, el abandono del tratamiento parece estar más relacionado con factores inherentes a la transición y cambio de servicio ya discutidos. A diferencia de este grupo, el grupo de pacientes con NSSI que abandonó el tratamiento presentó psicopatología distintiva y un mayor riesgo suicida, por lo que parece aún más importante intentar retener a los pacientes con problemas de comportamiento y/o gestos o intentos suicidas.

Sólo los problemas de conducta y la conducta prosocial fueron variables estadísticamente significativas. Los problemas de conducta antes de la edad adulta se han asociado con rasgos antisociales e incluso con criminalidad en la edad adulta (Murray et al., 2015; Pardini et al., 2018; Satterfield et al., 2007). Esto podría complicar la continuidad del tratamiento de la salud mental durante la edad adulta, siendo posible que algunos de estos pacientes terminen en diferentes entornos clínicos, como un hospital de día u otras instituciones como los servicios sociales o el servicio penitenciario. Por otro lado, nuestro análisis de regresión mostró que el comportamiento prosocial del adolescente fue la única variable que predijo el mantenimiento o abandono del seguimiento en salud mental. Esto puede explicarse si consideramos la asociación directa entre la conducta prosocial y el apego seguro (Gross et al., 2017; Mikulincer y Shaver, 2015), y la relación del apego seguro con una mejor adherencia al tratamiento (Benett et al., 2011; Ciechanowski et al., 2001). Dado que NSSI se ha asociado con apego inseguro (Cassels et al., 2019; Martin et al., 2017; Tatnell et al., 2014), y que el apego seguro y el comportamiento prosocial se presentan como importantes para la adherencia al

tratamiento, parece de gran importancia tener estos aspectos en cuenta en el tratamiento de salud mental de esta población.

Los hallazgos encontrados deben interpretarse en el contexto de las limitaciones del estudio. La caracterización clínica de la muestra se realizó al inicio del seguimiento en salud mental únicamente, sin conocer el posible cambio en el tiempo. Además el tamaño muestral al dividir en subgrupos fue pequeño y la frecuencia de ciertas conductas en este contexto fue baja, por lo que debemos ser precavidos a la hora de establecer conclusiones

A pesar de esto, estos hallazgos pueden tener importantes implicaciones para la práctica clínica con pacientes con NSSI, ya que resaltan la importancia de trabajar en aspectos específicos de los adolescentes como el comportamiento prosocial, que podrían disminuir el abandono del tratamiento en salud mental. Evitar este abandono en la transición de la adolescencia a la edad adulta joven de los pacientes con NSSI podría prevenir la evolución a otros problemas graves como el suicidio y los trastornos de personalidad.

Cohen (2019) reflexiona sobra la utilidad que pueden tener la salud digital y el uso de dispositivos móviles en la adherencia a los tratamientos. Desde la teoría de las relaciones objetales explica como estos dispositivos pueden actuar como un “objeto transicional” para los pacientes fomentando así el vínculo y la adherencia. En el caso de la adolescencia y las transiciones referidas en el paso a la adultez, esta idea cobra especial interés. Teniendo esto en cuenta, podríamos pensar en EMA como una herramienta no sólo de evaluación, sino de utilidad clínica para el mantenimiento del vínculo y el seguimiento.

En el segundo artículo incluido en este trabajo realizamos una revisión sistemática sobre el uso de EMA en NSSI y encontramos información exclusiva sobre la relación entre NSSI y un amplio número de variables como los estados emocionales, el contexto en el que ocurre la conducta, los rasgos de personalidad y las relaciones sociales entre otros.

La mayoría de estudios de EMA se centraron en analizar los estados emocionales que anteceden a NSSI, revelado en general una tendencia al incremento de los niveles de afecto negativo previos a la conducta. Además, varios estudios mostraron que el refuerzo negativo intrapersonal fue una de las motivaciones principales de la conducta (Andrewes et al., 2016, 2017., Armey et al., 2011, Nock et al., 2009; Shingleton et al., 2013). Los cambios en el afecto positivo que aparecen después de NSSI (Andrewes et al., 2016; Muehlenkamp et al., 2009; Turner at al.,, 2016a) también reflejan una función de refuerzo positivo de la misma. Todos estos estudios están en consonancia con la descrita función de regulación emocional de NSSI (Nock, 2010)

Aunque la mayoría de estudios analizados en la revisión se centraron en la evaluación del afecto, algunos consideraron la influencia de otras variables mediadoras y moderadoras necesarias para explicar el comportamiento más allá de los factores afectivos, como la impulsividad (Ammerman et al., 2017; Bresin et al., 2013), las rumiaciones (Zaki et al., 2013), o los eventos distales significativos (Anestis et al., 2012; Armey et al., 2012). Las funciones y los correlatos sociales de NSSI no fueron extensamente estudiados, aunque a grandes rasgos podemos concluir que un menor contacto y apoyo social estuvieron relacionados con la ocurrencia de NSSI (Santangelo et al., 2016; Turner et al., 2017). Por otro lado, se encontró que una sensación de apoyo

social posterior a la comunicación de la conducta a otros, tuvo una función de refuerzo de la misma (Turner et al., 2016a).

Existen limitaciones en este estudio de revisión principalmente relacionadas con la heterogeneidad entre los estudios seleccionados. El enfoque principal de la investigación fue el NSSI, pero algunos estudios incluyeron otros comportamientos o pensamientos autolesivos, aunque siempre bien definidos y diferenciados de NSSI. La heterogeneidad entre estudios incluye además de diferencias diagnósticas, diferencias muestrales, variabilidad en las variables dependientes evaluadas, diferencias en la forma de implementar EMA, en el periodo de evaluación y seguimiento, y en la adherencia. Si bien esta variabilidad no nos permite sacar conclusiones generalizables, nuestros criterios de selección nos permitieron incluir un mayor número de estudios y alcanzar el objetivo principal de esta revisión, que era examinar el estado actual del estudio NSSI a través de la EMA.

En conclusión, podemos decir que la EMA es una herramienta valiosa en el estudio de las NSSI que ya ha arrojado datos interesantes en esta área. Sin embargo, el número de estudios que aplican esta metodología es todavía escaso. La mayoría de los estudios se centran en la investigación del contexto en que se producen los NSSI, utilizan la EMA a corto plazo, han reclutado muestras pequeñas, y la representación de la población adolescente es muy insuficiente. Se necesitan estudios prospectivos de EMA a largo plazo, en los que se incluyan diferentes poblaciones con NSSI, en particular adolescentes y población clínica.

Precisamente el último artículo incluido en este trabajo se centra en la aplicación y el análisis de la aceptación y uso de un protocolo EMA a largo plazo aplicado en una muestra clínica de adolescentes en seguimiento ambulatorio en salud mental. En nuestro estudio, el 39,7% de la muestra se consideró usuaria de EMA (aceptaron y usaron la aplicación). Esta cifra está por encima de la encontrada en un estudio similar llevado a cabo en población clínica adulta (20,5%) (Barrigón et al., 2017a). La diferencia entre las cifras está en línea con los estudios que muestran una mejor aceptación de las intervenciones basadas en internet entre los jóvenes (Barrigón et al., 2017a; Lal y Adair, 2014).

Nuestros resultados indicaron que el porcentaje de pacientes con NSSI e intentos de suicidio fue significativamente mayor en el grupo de usuarios activos, mientras que el porcentaje de pacientes con trastornos hipercinéticos fue significativamente mayor en el grupo de no activos. Los análisis univariados confirmaron esta relación; sin embargo, el análisis de regresión logística no la confirmó en el caso de los intentos de suicidio, que no predijo el uso de EMA por sí solo.

El hallazgo de que los pacientes diagnosticados con trastornos hipercinéticos fueran menos propensos a usar EMA cobra sentido si tenemos en cuenta que estos pacientes se caracterizan por una evitación del esfuerzo mental y dificultades para mantener la constancia. Como se comentó en la introducción, la "carga" que puede suponer EMA para el sujeto es una de las mayores amenazas para su cumplimiento. El uso de EMA en esta población parece más complejo pero no inútil. Las adaptaciones apropiadas, como la participación de los padres (Miguélez-Fernández, 2018., O'Connor et al., 2017), períodos más cortos de evaluación (Whalen et al., 2002), el uso de modelos implícitos de EMA

(Berrouiguet et al., 2018), o facilitadores más generales, como la capacitación de los participantes y la vigilancia/control del cumplimiento, combinados con incentivos basados en el cumplimiento (Heron et al., 2017), podrían mejorar su uso.

Por otro lado, se encontró una relación positiva entre las conductas de autolesión y el uso de EMA, que está relacionada con resultados anteriores obtenidos en población adulta. Barrigón et al. (2017a) determinaron que los pacientes con pensamientos y planes suicidas tenían más probabilidades de ser usuarios activos de EMA en la población adulta.

Hay diferentes factores que podrían estar relacionados con la asociación entre la conducta de autolesión y el uso de EMA. Como ya se ha mencionado (Memon, 2018) los jóvenes que se autolesionan parece que hacen más uso de las nuevas tecnologías que otros para comunicarse con los demás. Por otro lado, Rickwood et al. (2016) observaron que los jóvenes que utilizaron apoyo en salud mental basado en aplicación web frente a presencial presentaron en mayor porcentaje niveles altos o muy altos de angustia psicológica, pero se encontraban en una etapa más temprana de enfermedad. Nuestros resultados están en consonancia con esto si consideramos que los adolescentes con NSSI sufren altos niveles de angustia psicológica y que podrían estar -según las teorías sobre el NSSI como puerta de entrada al suicidio (Grandclerc, 2016), y por su edad - en una etapa "temprana" de la enfermedad. Explicaciones alternativas sobre mayor uso de EMA en esta población podrían estar relacionadas con el hecho de que quizás, la participación y monitorización por parte de los cuidadores es mayor en pacientes con un historial de conducta autolesiva.

Nuestro estudio tiene varias limitaciones. El tamaño de la muestra fue pequeño y la variabilidad del diagnóstico también fue limitada. Debemos reconocer que ciertas conductas tuvieron una baja frecuencia (como por ejemplo algunas conductas de autolesión) por lo que debemos ser cautelosos al sacar conclusiones y tomar estos resultados como provisionales. El hecho de que hayamos utilizado una muestra clínica de adolescentes de conveniencia también limita la generalización de nuestros resultados, sin embargo, esto hace que los resultados sean ecológicos y adaptados al entorno clínico real. En relación con el diseño y funcionalidad de nuestra aplicación EMA (MeMind), esta todavía tiene algunas limitaciones como la falta de ventanas emergentes o recordatorios, que hacen que el cumplimiento sea más complicado. El hecho de que los pacientes no tuvieran ningún incentivo directo para completar EMA también complica el cumplimiento y la adherencia.

Sin embargo, hasta donde sabemos, éste es el primer estudio que examina específicamente las variables personales que están en relación con el uso de EMA en adolescentes en seguimiento en servicio ambulatorio de salud mental. Este estudio tiene implicaciones clínicas y de investigación, ya que proporciona pistas sobre la aplicación de la EMA en diversas subpoblaciones clínicas.

Como conclusión general podemos decir que EMA es una herramienta de uso factible y con gran potencial en el uso de población clínica adolescente con NSSI. Para futuros estudios se considera la inclusión de muestras más grandes, así como la mejora de la herramienta EMA y su adherencia. Una de las líneas de investigación está en identificar eventos y estados que nos ayuden a predecir las conductas de riesgo como NSSI y el paso a conductas más graves como los intentos de suicidio. Además, también se plantea el

estudio de otros beneficios clínicos que pueda generar EMA, como la mejora de la adherencia general al tratamiento de salud mental.

5. CONCLUSIONES

1. Los El 34% de los pacientes con historia de NSSI en la adolescencia abandonaron su seguimiento en salud mental antes de llegar a la etapa adulta.

2. Se hallaron diferencias clínicas estadísticamente significativas entre los pacientes con historia de NSSI que abandonaron el seguimiento y los que mantuvieron el seguimiento.

3. Los pacientes con historia de NSSI que abandonaron el seguimiento presentaron puntuaciones más altas de psicopatología conductual ($t= 2.121$; $gl=36$; $p<0.05$) y mayor riesgo suicida por lo que es importante identificar a estos pacientes para evitar su abandono.

4. Los pacientes con historia de NSSI que mantuvieron seguimiento presentaron puntuaciones más altas en conducta prosocial ($t= -2.086$; $gl=35$; $p<0.001$) y esta variable predijo el seguimiento. Por lo tanto, desde el punto de vista asistencial es importante trabajar la conducta prosocial para favorecer el vínculo y el seguimiento.

5. El EMA es una herramienta válida para la evaluación y seguimiento de NSSI. Son necesarios más estudios longitudinales en muestras clínicas y de adolescentes dada su escasez.

6. Un 40% de los pacientes adolescentes utilizaron la aplicación EMA durante el estudio EMA de seguimiento ambulatorio.

7. En el estudio EMA de seguimiento ambulatorio con adolescentes se encontró una relación positiva entre la conducta autolesiva y el uso de EMA.

8. El 65% de los pacientes con NSSI usó la aplicación frente al 36% de los pacientes sin NSSI ($\chi 2$=9.35; gl= 1; p<0.001).

9. El uso de nuevas tecnologías en el seguimiento puede favorecer el vínculo y el mantenimiento del tratamiento en salud mental en pacientes con historia de NSSI.

10. Futuras investigaciones deben centrarse en la aplicación y mejora de los protocolos EMA en paciente adolescentes con NSSI en muestras clínicas.

6. APÉNDICE

6.1. TRABAJOS EN FORMATO WORD

6.1.1. A longitudinal study of adolescents engaged in Non-Suicidal Self Injury (NSSI): clinical follow-up from adolescence to young adulthood

Abstract

The main aim of the current study is to examine the demographic and clinical factors that predict a continuity of the use of Mental Health Services (MHS) in adulthood by subjects who have engaged in non-suicidal-self-injury behaviors (NSSI) and have been followed in MHS in their teen years. A cohort of 147 participants was selected from an original sample of 267 adolescent patients recruited from the Child and Adolescent Outpatient Psychiatric Services. Patients were divided into two groups: those who had engaged in NSSI (NSSI-group), and those who had not (non-NSSI-group). Rate of use of MHS in adulthood was calculated for both groups and univariate analyses and binary logistic regression analysis were applied. In the NSSI-group, two factors appeared to influence a continuity of the use of MHS in adulthood. Prosocial behavior was associated with a greater use of MHS in adulthood whereas behavioral problems were associated with less use. Only prosocial behavior was maintained in the regression model as a predictor. Our findings could have implications for clinical practice with NSSI patients and highlight the importance of working on specific areas that could prevent treatment abandonment in the transition from adolescence to adulthood.

Keywords: self-harm, NSSI, treatment, prosocial, adherence, evolution.

Introduction

Non-Suicidal Self Injury (NSSI) is defined as the direct and deliberate destruction of body tissue without suicidal intent (Nock & Favazza, 2009). Conceptualization and assessment of NSSI has evolved substantially in recent years and has even been included as a distinct syndrome in the section 'Conditions for Further Study' in the DSM-V (American Psychiatric Association, 2013). However, some recent critiques based on cumulative research into NSSI disorder (NSSI-D) question the clinical utility of the proposed diagnostic criteria and recommend a more dimensional approach (Buelens et al., 2020; Hooley et al., 2020). For instance, Criterion A, concerning the frequency and duration of NSSI, defined as "five or more occasions over one year", does not provide a meaningful distinction between the groups. Moreover, number and type of NSSI motivations (B) seems to be very restricted and the criterion corresponding to an association between the behavior or its consequences and clinically significant distress or impairment (E) is potentially problematic, since NSSI is often used to improve mood and alleviate distress (Hooley et al., 2020). In our study, we assessed the behavior and not the syndrome, since we consider the behavior to also have clinical relevance.

NSSI onset typically occurs during adolescence (Cipriano et al., 2017; Klonsky et al., 2014; Muhlenkamp & Gutierrez, 2007) and prevalence rates are high in both clinical and epidemiological samples. Prevalence in non-clinical samples is over 17.2% in adolescents, 13.4% in young adults, and 5.5% in adults (Swannell et., 2014). Prevalence in clinical samples is less well-defined and usually involves inpatient samples. The estimated prevalence in clinical adolescent inpatient samples is around 50% (Glenn &

Klonsky, 2013; Kaess et al., 2013). We only found one study that reported prevalence in a clinical outpatient sample of adolescents and this was estimated to be around 22% (Díaz de Neira, 2014). Studies in clinical outpatient samples are uncommon, yet are necessary due to the challenges of managing this behavior in an outpatient setting.

Garcia Nieto et al. (2015) and Díaz de Neira (2014) studied the clinical characterization of a clinical outpatient adolescent population. These authors found that NSSI was associated with difficulties in emotional and behavioral domains measured with the Strengths and Difficulties Questionnaire (Marzocchi et al., 2004), with depression symptoms measured with the Children Depression Inventory (Del Barrio et al., 2002) and with anger internalization (STAXI-NA; Del Barrio et al., 2006). Family functioning (APGAR; Bellón et al., 1996) was found to be a protective factor against NSSI (Díaz de Neira, 2014). Despite the increase in information related to adolescent NSSI clinical characterization in recent years, the clinical evolution of subjects who engaged in NSSI during their adolescence is not well documented, and raises more questions than answers (Whitlock & Selekman, 2014).

In general, there has been an increase in NSSI longitudinal studies over the last ten years, although these are still scarce, and most of them only cover short-term follow-up periods. Moreover, few studies are carried out in clinical samples (Adrian et al., 2019; Glenn et al., 2017; Groschwitz et al., 2015; Prinsten et al., 2010). Studies tend to focus on determining which factors longitudinally predict future NSSI, and have shown that past NSSI is one of the best predictors (Cox et al., 2012; Glen & Klonsky, 2011; Wichstrøm, 2009). However, they do not usually consider factors related to a patient's clinical follow-up, nor do they account for gaps between the different developmental

stages. We found some recent longitudinal studies that examined the clinical evolution from adolescence to young adulthood in clinical samples. Adrian et al. (2019) explored the growth of non-NSSI over time and highlighted the stable nature of NSSI and the contribution of emotion dysregulation and internalizing symptoms to NSSI patterns. Groschwitz et al. (2015) studied the clinical evolution of former adolescent self-injurers in young adults in a clinical outpatient sample. They collected data from 52 former adolescent mental health patients with NSSI aged between 18 and 30 years old at the time of the study. They found that although NSSI can decline over time, this psychopathology tends to prevail in young adulthood. Two thirds of participants still met criteria for an axis I psychiatric disorder in adulthood, and 61.5% of participants met criteria for an axis II condition. Nevertheless, 54% of all participants reported not receiving any mental health treatment. Moreover, early onset NSSI was found to be a risk factor for adult Borderline Personality Disorder and was highly associated with suicidal thoughts and behaviors.

With the high prevalence of NSSI and its association with elevated psychopathology, suicide attempts, and the substantial financial burden this implies for society (Hauber et al., 2019), NSSI can be considered a major public health concern (Glenn et al., 2017). The lack of treatment of NSSI entails not only a significant personal cost, but is also costly for society.

As far as we know, no studies focus on the continuity or abandonment of mental health services (MHS) during follow-up in patients who have engaged in NSSI. It is important to comprehend which factors are related to the continuity or abandonment of mental health treatment from adolescence to young adulthood, since a high percentage of NSSI

adolescents continue with mental health problems during their adult lives (Groschwitz et al., 2015). Moreover, detection of these factors could help clinicians to design strategies to target them and to improve adherence to treatment.

A recent systematic review that studied the factors affecting adolescent adherence to mental health treatment (Timlin et al., 2015) reported that adolescents own positive beliefs towards their treatment, and good cohesion with close supportive people appeared to be positively related to adherence, whereas sociodemographic characteristics were not related. "Good cohesion with close supportive people" is linked to the concept of secure attachment, that has also been associated with a better adherence to treatment in other pathologies (Benett et al., 2011; Ciechanowski et al., 2001). On the other hand, behavioral problems such as antisocial behaviors and behavioral disorders identified during adolescence have been associated with a worse adherence to treatment in chronic illness in young people (Bryden et al., 2001).

The aims of the current study were twofold. The first was to describe the clinical characteristics (including clinical follow-up from adolescence to young adulthood) of former adolescent patients engaged in NSSI. The second was to determine which demographic and clinical factors are related to the continuity or abandonment of mental health treatment from adolescence to young adulthood.

Materials and methods

Participants and Procedure

A cohort of 147 adult subjects were selected from an original sample of 267 adolescent patients recruited from the Child and Adolescent Outpatient Psychiatric Services of University Hospital Jiménez Díaz Foundation (Madrid, Spain) from November 2011 to October 2012. In the original study (Díaz de Neira 2014; García-Nieto et al., 2015), participants were assessed in several areas. We have follow-up data on these patients until 31st December 2016. Subjects older than 18 years at that date (147) have been included in the present study.

All participants were administered the Spanish version of the Self-Injurious Thoughts and Behaviors Interview –SITBI– (Garcia-Nieto et al., 2013), which is a structured interview that assesses the presence, frequency, and characteristics of suicidal ideation, suicide plans, suicide gestures, suicide attempts, and non-suicidal self injury. Participants were also administered the Spanish adaptation of the Children's Depression Inventory –CDI– (Del Barrio et al., 2002) that measures depressive symptoms, and the Spanish adaptation of the Family APGAR –APGAR– (Bellón et al., 1996) that measures the extent to which a family works as a unit. Participants and parents, or legally authorized representatives, were administered the Spanish version of the Strengths and Difficulties Questionnaire –SDQ– (Marzocchi et al., 2004) that measures psychological adjustment and general psychopathology. Sociodemographic data were obtained by a semi-structured interview.

Clinical follow-up data on the number and type of consultations from 2011 to 2016 were obtained from the clinical records of participants who were adults in December

2016. The abandonment or maintenance of mental health treatment was also recorded. Patients who had been discharged were not included in the analysis.

Written informed consent at first assessment was obtained from patients who agreed to participate and their parents or legally authorized representatives. Subjects under 11 years old, subjects over 18 years old, and/or those who lacked the capacity to comprehend the questionnaires used in the study were excluded. The Jiménez Díaz Foundation Ethics Committee approved the study.

Data Analysis

For purposes of analysis, subjects were first divided into two groups: NSSI (patients who had engaged in NSSI according to SITBI) and non-NSSI (patients who had not engaged in NSSI according to SITBI). Univariate analyses using chi-square and t-test were performed to characterize the sample and to compare both groups. Sociodemographic and clinical measures were analyzed. Some clinical measures were not included in this analysis since they had already been reported in a previous study (Díaz de Neira, 2014). We also performed a survival analysis during clinical follow-up.

Subsequently, we performed univariate analyses in each group to compare the clinical and sociodemographic characteristics of patients who continued with treatment after the age of 18 and patients who did not.

A regression analysis was carried out to establish the magnitude of the association between certain measures and continued treatment. We performed binary logistic regression analyses with all the significant variables as predictors of follow-up after the age of 18.

Results

Only patients aged 18 years or older on 31st December 2016 were selected from the original sample (2011-2012). The mean age of this selected sample was 19.8 years (SD=1.4; min=18 yrs, max=23 yrs) in December 2016. Data from these 147 subjects is presented in this paper.

Sociodemographic Characteristics of the Sample

Participants were assessed for the first time in 2011-2012. The sample was comprised of 61.4% men and 38.6% women, with a mean age of 15 years old (SD=1.3) at the time of the first assessment. Most subjects were Spanish 83% and

45.5 % of participants had repeated a school year at least once. Sociodemographic characteristics were similar in both the NSSI and non-NSSI groups (Table 1).

Table 1

Sociodemographic Characteristics of the Sample

Sociodemographic characteristics	Total N= 147	NSSI N=44	Non NSSI N=103	t / x^2	df	*p* value
Sex (% males)	61.2% (90)	59.1% (26)	62.1% (64)	0.120	1	.85
Age (*M* ± *SD*)	15.34 (± 1.3)	15.32 (± 1.5)	15.35 (± 1.2)	0.132	145	.90
Country of origin (% Spanish)	83% (122)	77.3 % (34)	85.4 % (88)	1.456	1	.24
Repeated a grade (% repeated at least once)	45.5 % (65/143)	50% (22/44)	43.4 % (43/99)	0.530	1	.47

Note. p values significant at the **p* < .05 level (bilateral)

Clinical Characteristics of the Sample

The clinical characteristics of the total sample and of NSSI and non-NSSI groups in relation to self-harm behaviors and clinical follow-up are shown in Table 2.

The occurrence of other self-harm behaviors (suicidal ideation, suicide planning, suicidal gesture and suicidal attempt) was always higher in the group of NSSI. However, differences only reached statistical significance for suicidal ideation ($\chi 2 = 15.679$ $p < 0.001$).

The NSSI group received more consultations on average than the non-NSSI group ($t = -2.077$ $p = .04$). The average number of hospitalizations and emergencies were similar in both groups. However, four of the total six hospitalizations occurred in the group of NSSI, and five of the total nine emergencies.

A total of 65.3% of the sample continued receiving mental health follow-up after the age of 18, with no differences between the NSSI (65.9%) and non-NSSI groups (65%) ($\chi 2 = 0.010$ $p = 1.000$). The average follow-up time in days during the study period was 1078 (S.D= 617) (three years) and there were no differences in the survival curves between NSSI and non-NSSI (Fig.1). Median survival times for NSSI and non-NSSI groups were 949 and 1328 days, respectively ($\chi 2 = 1.769$ $p = 0.183$).

Table 2

Clinical Characteristics of the Sample

	Total N= 147	NSSI N=44	Non NSSI N=103	t / x^2	df	p value
Self-harm behaviors						
Lifetime suicidal ideation	25.9 % (38)	47.7 % (21)	16.5% (17)	15.679	1	.00**
Lifetime suicidal planification	4.1 % (6)	6.8 % (3)	2.9 % (3)	1.228	2	.54
Lifetime suicidal gesture	11.6 % (17)	18.2 % (8)	8.7 % (9)	2.784	2	.25
Lifetime suicidal attempt	6.8 % (10)	13.6 % (6)	3.9 % (4)	4.995	2	.08

Follow-up

Outpatient consultations	21 (± 15.8)	25 (± 19.6)	19 (± 13.5)	-2.077	145	.04*
Hospitalizations	1.2 (0.4)	1.25 (0.5)	1 (0)	-0.667	4	.54
Emergencies	2.7 (2.1)	3.40 (2.6)	1.75(1)	-1.189	7	.27
Maintain follow up after 18 years old	65.3% (96)	65.9% (29)	65% (67)	0.010	1	1.00

Note. *p < .05, **p < .01.

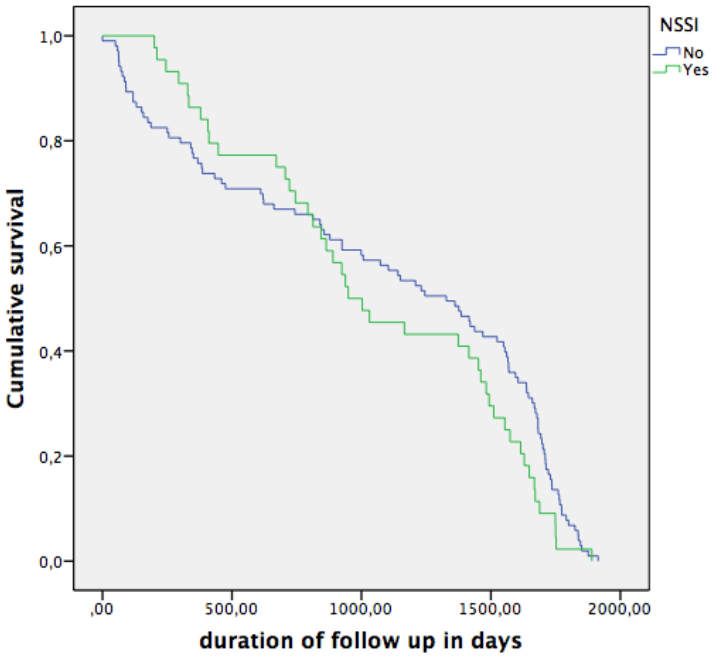

Figure 1. *Survival analysis of NSSI and non-NSSI group*

Differences Between Groups who Continued or Abandoned Treatment

Differences in the NSSI Group

We compared the sociodemographic and clinical characteristics of NSSI patients who remained in follow-up after 18 years old (greater continuity of the use of MHS) and patients who left treatment before this age (less continuity of the use of MHS). We found that the percentage of suicidal gestures and attempts were higher in the group of patients that left treatment, although these differences were not statistically significant. Emotional measures (CDI, SDQ emotional) were more severe in the group of patients that remained in treatment (greater continuity of the use of MHS), while other clinical measures (rest of SDQ scores and family Apgar) were more severe in the group of patients that left treatment before the age of 18. However, these differences were only statistically significant in SDQ-A Conduct (t = 2.121 p = 0.000) (more behavioral problems were

recorded in the adolescent group that left treatment) and SDQ-P Prosocial (t = -2.086 p = 0.044) (better prosocial behavior measured by parents in the group remaining in treatment). (See supplemental material. Table S1)

Differences in the non-NSSI Group (Control Group)

We compared the sociodemographic and clinical characteristics of non-NSSI patients who remained in follow-up after 18 years old and patients who left treatment before this age.

We did not find statistically significant differences in any measure between the groups (see supplemental material. Table S2).

Regression model

Calibration was evaluated using the Hosmer-Lemesow goodness of fit test obtaining good results ($\chi 2$ = 4.027 p = 0.545). The only variable that remained in the regression model was "SDQ-P Prosocial". NSSI patients with higher "SDQ-P Prosocial" score were more prone to remain in treatment (OR= 1.22, 95% CI 1.03-1.44) (Table 3).

Table 3 *Summary of Logistic Regression Analyses for Variables Predicting Treatment Maintenance in NSSI patients*

Predictor	B	SE B	OR (95% CI)
SDQP Prosocial	0.20*	0.09	1.22 (1.03-1.44)
Constant	-0.77	0.65	0.49

Note. *p < .05 OR= Odds Ratio

Discussion

In this naturalistic study, the objectives were to describe the clinical characteristics of former adolescent patients engaged in NSSI and to examine which demographic and clinical factors were associated with continuity or abandonment of mental health treatment from adolescence to young adulthood.

Since we already knew other clinical differences between NSSI adolescent patients and non-NSSI adolescent patients in this sample from previous studies (Díaz de Neira, 2014; Garcia-Nieto et al., 2015), we only reviewed self-harm behaviors and clinical follow-up. Suicidal ideation, suicide planning, suicide gesture and suicidal attempt were always higher in the NSSI group. However, the prevalence of these behaviors was low and, probably because of this, only suicidal ideation (higher rate) reached statistical significance. Suicidal ideation was more common in the NSSI group, which agrees with previous studies in the literature that reported that suicidal behavior and NSSI frequently coexist (Nock et al., 2006). NSSI has even been considered an important risk factor for

suicide (Grandclerc et al., 2016; Whitlock et al., 2013). Nevertheless, the actual extent of this relationship remains unclear and is beyond the scope of our study.

Regarding the clinical follow-up of the sample, we found that the NSSI group received more consultations, probably due to the fact that NSSI is related to increased psychopathology and risk of suicide (Ougrin et al., 2012). However, we did not find differences in the total time of clinical follow-up, and more than a third of patients abandoned mental health treatment before reaching young adulthood in both groups. Therefore, abandonment in this transition appears to be generalized and not specific to NSSI, and might be partially influenced by how mental health services are structured. Patients are treated by child and adolescent services until the age of 18, at which point they are treated in adult services. Although this transition is facilitated in our services (both services are located in the same place and specialists coordinate with each other) many young people are at risk of disengagement (Broad et al., 2017; Cleverley et al., 2020; Pai, 2011). We also found other factors that influenced abandonment or continuity of treatment, such as behavioral problems and prosocial behavior. Behavioral problems were more common in NSSI patients who abandoned treatment, which is in line with the study of Bryden et al. (2001). This finding is not surprising if we consider some characteristics inherent to behavioral problems, such as difficulties in establishing relationships and following rules (Ogundele, 2018). In addition, behavioral problems before adulthood have been associated with antisocial features and even criminality in adulthood (Murray et al., 2015; Pardini et al., 2018; Satterfield et al., 2007). This could complicate the continuity of mental health treatment during adulthood, as some of these patients end up in different clinical settings or other institutions, such as social services or penitentiary service. The fact that this was only significant in the NSSI group might be

related to the fact that behavioral problems are more prominent in NSSI patients (Díaz de Neira, 2014). Complementary to this, we found that prosocial behavior was the only variable that predicted adherence to treatment in NSSI. Our results are corroborated by the direct association between prosocial behavior and secure attachment (Gross et al., 2017; Mikulincer & Shaver, 2015) and the fact that secure attachment has already been related to a better adherence to treatment in certain pathologies (Benett et al., 2011; Ciechanowski et al., 2001, Timlin et al., 2015). NSSI has been associated with insecure attachment (Cassels et al., 2019; Martin et al., 2017; Tatnell et al., 2014), hence working on establishing a trusting relationship and prosocial behavior should be a priority.

We found that the percentage of suicidal gestures and attempts were higher in the group of NSSI patients that left treatment. Although these differences were not statistically significant (the sample size was small), they are still interesting. This result contrasts with our findings for the non-NSSI group. In the non-NSSI group we did not find clinical differences between patients that continued and left treatment. In this case, the abandonment of treatment seems to be more related to factors inherent to the transition between health services previously discussed. Unlike the non-NSSI group, the group of NSSI patients that left treatment present distinct psychopathology and higher suicidal risk. It, therefore, seems even more important to try to retain NSSI patients with behavioral problems and/or suicidal gestures and attempts.

Our findings could have important implications for clinical practice with NSSI patients, as they highlight the importance of working on specific aspects of adolescents, such as prosocial behavior, which can influence the continuity of mental health treatment. Avoiding mental health treatment abandonment in the transition from adolescence to

young adulthood of NSSI patients could also prevent the evolution to other serious problems such as suicide and personality disorders.

All these findings should be interpreted in the context of the limitations of the present study. Clinical variables were only measured at the start of mental health treatment and were not analyzed at the end of treatment, when they could well have changed. Moreover, the sample size was small and some of the frequencies were low; hence we must be cautious when drawing conclusions and regard these results as provisional. Further research is therefore warranted to confirm our findings.

Nevertheless, to the best of our knowledge, this is the first study that longitudinally focuses on the clinical follow-up of NSSI patients from Child and Adolescent Mental Health Services to Adult Mental Health Services. It has important clinical implications, providing clues to help improve mental health follow-up in these patients.

References

Adrian, M., Zeman, J., Erdley, C., Whitlock, K., Sim L., 2019. Trajectories of non-suicidal self-injury in adolescent girls following inpatient hospitalization. Clin. Child. Psychol. Psychiatry. 24(4), 831-846

American Psychiatric Association., 2013. Diagnostic and statistical manual of mental disorders, 5th ed. APA: Washington.

Bellón, J. A., Delgado, A., Luna, J. D., Lardelli, P., 1996. Validez y fiabilidad del cuestionario de función familiar Apgar-familiar. Atención Primaria, 18(6), 289-296.

Bennett, J. K., Fuertes, J. N., Keitel, M., Phillips, R., 2011. The role of patient attachment and working alliance on patient adherence, satisfaction, and health-related quality of life in lupus treatment. Patient Educ. Couns. 85(1), 53–59. https://doi.org/10.1016/j.pec.2010.08.005

Broad, K. L., Sandhu, V. K., Sunderji, N., Charach, A., 2017. Youth experiences of transition from child mental health services to adult mental health services: a qualitative thematic synthesis. BMC Psychiatry. 17(1), 380. https://doi.org/10.1186/s12888-017-1538-1

Bryden, K.S., Peveler, R. C., Stein, A., Neil, A., Mayou, R. A., Dunger, D. B., 2001. Clinical and psychological course of diabetes from adolescence to young adulthood: A longitudinal cohort study. Diabetes Care. 24, 1536–1540.

Buelens., T, Luyckx, K., Kiekens, G., Gandhi, A., Muehlenkamp, J.J., Claes, L., 2020. Investigating the DSM-5 criteria for non-suicidal self-injury disorder in a community sample of adolescents. Journal of Affective Disorders. 260, 314–22

Cassels, M., Baetens, I., Wilkinson, P., Hoppenbrouwers, K., Wiersema, J. R., Van Leeuwen, K., Kiekens, G., 2019. Attachment and Non-Suicidal Self-Injury among

Young Adolescents: The Indirect Role of Behavioral Problems. Arch. Suicide Res. 23(4), 688–696. https://doi.org/10.1080/13811118.2018.1494651

Ciechanowski, P. S., Katon, W. J., Russo, J. E., Walker, E. A., 2001. The patient-provider relationship: attachment theory and adherence to treatment in diabetes. Am J Psychiatry. 158(1), 29–35. https://doi.org/10.1176/appi.ajp.158.1.29

Cipriano, A., Cella, S., Cotrufo, P., 2017. Nonsuicidal Self-injury: A Systematic Review. Front. Psychol. 8, 1946. https://doi.org/10.3389/fpsyg.2017.01946

Cleverley, K., Rowland, E., Bennett, K., Jeffs, L., Gore, D., 2020. Identifying core components and indicators of successful transitions from child to adult mental health services: a scoping review. Eur. Child Adolesc. Psychiatry. 29 (2), 107–121. https://doi.org/10.1007/s00787-018-1213-1

Cox, L. J., Stanley, B. H., Melhem, N. M., Oquendo, M. A., Birmaher, B., Burke, A., Kolko, D. J., Zelazny, J. M., Mann, J. J., Porta, G., Brent, D. A., 2012. A longitudinal study of nonsuicidal self-injury in offspring at high risk for mood disorder. J. Clin. Psychiat, 73(6), 821–828. https://doi.org/10.4088/JCP.11m07250

Díaz de Neira, M., 2014. Características psicopatológicas, acontecimientos vitales estresantes y conductas autolesivas suicidas y no suicidas en adolescentes evaluados en salud mental. Universidad Autónoma de Madrid, Madrid.

Del Barrio, V., Roa, M. L., Olmedo, M., Colodron, F., 2002. Primera adaptación del CDI a la población española. Acción Psicológica. 3, 263-272.

Del Barrio, V., Spielberger, C. D., Aluja, A., 2006. STAXI-NA. Inventario de Expresión de Ira Estado-Rasgo en niños y adolescentes, first ed. TEA Ediciones.

García-Nieto, R., Blasco-Fontecilla, H., Paz Yepes, M., Baca-García, E., 2013. Translation and validation of the "Self-Injurious Thoughts and Behaviours

Interview" in a Spanish population with suicidal behaviour. Revista de Psiquiatría y Salud Mental. 6 (3), 101–108. https://doi.org/10.1016/j.rpsmen.2012.07.004

García-Nieto, R., Carballo, J. J., Hernando, M. D. de N., León-Martinez, V., Baca-García, E., 2015. Clinical Correlates of Non-Suicidal Self-Injury (NSSI) in an Outpatient Sample of Adolescents. Arch. Suicide Res. 19(2), 218–230. https://doi.org/10.1080/13811118.2014.957447

Glenn, C. R., Klonsky, E. D., 2011. Prospective prediction of nonsuicidal self-injury: A 1-year longitudinal study in young adults. Behav. Ther. 42 (4), 751–762. https://doi.org/10.1016/j.beth.2011.04.005

Glenn, C. R., Klonsky, E. D., 2013. Nonsuicidal self-injury disorder: an empirical investigation in adolescent psychiatric patients. J. Clin. Child. Adolesc. Psychol. 42(4), 496–507.

Glenn, C. R., Lanzillo, E. C., Esposito, E. C., Santee, A. C., Nock, M. K., Auerbach, R. P., 2017. Examining the Course of Suicidal and Nonsuicidal Self-Injurious Thoughts and Behaviors in Outpatient and Inpatient Adolescents. J. Abnorm. Child Psychol. 45(5), 971–983. https://doi.org/10.1007/s10802-016-0214-0

Grandclerc, S., De Labrouhe, D., Spodenkiewicz, M., Lachal, J., Moro, M.-R., 2016. Relations between Nonsuicidal Self-Injury and Suicidal Behavior in Adolescence: A Systematic Review. PloS One, 11(4), e0153760. https://doi.org/10.1371/journal.pone.0153760

Groschwitz, R. C., Plener, P. L., Kaess, M., Schumacher, T., Stoehr, R., Boege, I., 2015. The situation of former adolescent self-injurers as young adults: A follow-up study. BMC Psychiatry, 15.

Gross, J. T., Stern, J. A., Brett, B. E., Cassidy, J., 2017. The multifaceted nature of prosocial behavior in children: Links with attachment theory and research. Soc. Dev. 26(4), 661–678. https://doi.org/10.1111/sode.12242

Hauber, K., Boon, A., Vermeiren, R., 2019. Non-suicidal Self-Injury in Clinical Practice. Front. Psychol. 10. https://doi.org/10.3389/fpsyg.2019.00502

Hooley, J.M., Fox, K. R., Boccagno, C., (2020). Nonsuicidal Self-Injury: Diagnostic Challenges And Current Perspectives [Internet]. Neuropsychiatr. Dis. and Treat.16, 101-112.

Kaess, M., Parzer, P., Mattern, M., Plenner, P., Bifulco, A., Resch, F., et al.2013. Adverse childhood experiences and their impact on frequency, severity, and the individual function of nonsuicidal self-injury in youth. Psychiatry Res. 206, 265–72.

Klonsky, E. D., Victor, S. E., Saffer, B. Y., 2014. Nonsuicidal Self-Injury: What We Know, and What We Need to Know. Can. J. Psychiatry. 59(11), 565–568.

Martin, J., Bureau, J.-F., Lafontaine, M.-F., Cloutier, P., Hsiao, C., Pallanca, D., Meinz, P., 2017. Preoccupied but not dismissing attachment states of mind are associated with nonsuicidal self-injury. Dev. Psychopathol. 29(2), 379–388. https://doi.org/10.1017/S0954579417000050

Marzocchi, G. M., Capron, C., Di Pietro, M., Duran Tauleria, E., Duyme, M., Frigerio, A., Gaspar, M. F., Hamilton, H., Pithon, G., Simões, A., Thérond, C., 2004. The use of the Strengths and Difficulties Questionnaire (SDQ) in Southern European countries. Eur. Child. Adoles. Psy. 13(2), ii40-ii46. https://doi.org/10.1007/s00787-004-2007-1

Mikulincer, M., Shaver, P. R. , 2015. An Attachment Perspective on Prosocial Attitudes and Behavior. The Oxford Handbook of Prosocial Behavior. https://doi.org/10.1093/oxfordhb/9780195399813.013.010

Muehlenkamp, J. J., Gutierrez, P. M., 2007. Risk for suicide attempts among adolescents who engage in non-suicidal self-injury. Arch. Suicide Res. 11(1), 69–82. https://doi.org/10.1080/13811110600992902

Murray, J., Menezes, A. M. B., Hickman, M., Maughan, B., Gallo, E. A. G., Matijasevich, A., Gonçalves, H., Anselmi, L., Assunção, M. C. F., Barros, F. C., Victora, C. G., 2015. Childhood behaviour problems predict crime and violence in late adolescence: Brazilian and British birth cohort studies. Soc. Psychiatry. Psychiatr. Epidemiol. 50(4), 579–589. https://doi.org/10.1007/s00127-014-0976-z

Nock, M. K., Favazza, A. R., 2009. Nonsuicidal self-injury: Definition and classification. In Understanding nonsuicidal self-injury: Origins, assessment, and treatment. American Psychological Association., pp. 9–18. https://doi.org/10.1037/11875-001

Nock, M. K., Joiner, T. E., Gordon, K. H., Lloyd-Richardson, E., Prinstein, M. J., 2006. Non-suicidal self-injury among adolescents: diagnostic correlates and relation to suicide attempts. Psychiatry Res. 144(1), 65–72. https://doi.org/10.1016/j.psychres.2006.05.010

Ogundele, M.O., 2018. Behavioural and emotional disorders in childhood: A brief overview for paediatricians. World J. Clin. Pediatr. 7(1), 9–26.

Ougrin, D., 2012. Practitioner review: Self-harm in adolescents. J. Child Psychol. Psychiatry, and allied disciplines. 53(4), 337-50.

Pai, A.L.H., Ostendorf, H. M., 2011. Treatment adherence in adolescents and young adults affected by chronic illness during the health care transition from pediatric to adult health care: A literature review. Child. Health Care. 40(1), 16–33.

Pardini, D. A., Byrd, A. L., Hawes, S. W., Docherty, M., 2018. Unique Dispositional Precursors to Early-Onset Conduct Problems and Criminal Offending in Adulthood. J. Am. Acad. Child Adolesc. Psychiatry 57(8), 583–592. https://doi.org/10.1016/j.jaac.2018.04.013

Prinstein, M. J., Heilbron, N., Guerry, J. D., Franklin, J. C., Rancourt, D., Simon, V., Spirito, A., 2010. Peer influence and nonsuicidal self injury: Longitudinal results in community and clinically-referred adolescent samples. J. Abnorm. Child. Psychol. 38(5), 669–682. https://doi.org/10.1007/s10802-010-9423-0

Satterfield, J. H., Faller, K. J., Crinella, F. M., Schell, A. M., Swanson, J. M., Homer, L. D., 2007. A 30-year prospective follow-up study of hyperactive boys with conduct problems: adult criminality. J. Am. Acad. Child. Adolesc. Psychiatry. 46(5), 601–610. https://doi.org/10.1097/chi.0b013e318033ff59

Swannell, S. V., Martin, G. E., Page, A., Hasking, P., St John, N. J., 2014. Prevalence of nonsuicidal self-injury in nonclinical samples: systematic review, meta-analysis and meta-regression. Suicide Life Threat. Behav. 44(3), 273–303. https://doi.org/10.1111/sltb.12070

Tatnell, R., Kelada, L., Hasking, P., Martin, G., 2014. Longitudinal analysis of adolescent NSSI: the role of intrapersonal and interpersonal factors. J. Abnorm. Child Psychol. 42(6), 885–896.

Timlin, U., Hakko, H., Heino, R., Kyngäs, H., 2015. Factors that Affect Adolescent Adherence to Mental Health and Psychiatric Treatment: a Systematic Integrative

Review of the Literature. Scand. J. Child Adolesc. Psychiatr. Psychol. 3(2), 99–107.

Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Baral Abrams, G., Barreira, P., Kress, V., 2013. Nonsuicidal self-injury as a gateway to suicide in young adults. J. Adolescent Health. 52(4), 486–492. https://doi.org/10.1016/j.jadohealth.2012.09.010

Whitlock, J., Selekman, M. D., 2014. Nonsuicidal Self-Injury Across the Life Span. The Oxford Handbook of Suicide and Self-Injury. https://doi.org/10.1093/oxfordhb/9780195388565.013.0010

Wichstrøm, L., 2009. Predictors of non-suicidal self-injury versus attempted suicide: similar or different?. Arch. Suicide Res. 13(2), 105–122.

6.1.2. Use of Ecological Momentary Assessment (EMA) in Non-Suicidal Self-Injury (NSSI): A systematic review

Abstract

Conceptualization and assessment of non-suicidal self-injury (NSSI) has evolved substantially in recent years. In both cross-sectional and longitudinal studies, NSSI and its related variables have traditionally been assessed retrospectively, leading to less precise studies of the mechanisms involved in the maintenance, cessation, or aggravation of this behavior. Ecological momentary assessment (EMA) enables real-time collection of patient states, which can be very useful in the study of the mechanisms implied in this behavior. This systematic review aims to elucidate the current status of EMA use in NSSI investigation. An exhaustive search in PubMed and PsycINFO was conducted up to September 2017. All papers included were focused on the study of NSSI using EMA. Studies with methodological diversity were included, which were afterwards organized according to main topic of studies. There were no ineligibility criteria based on age or diagnosis. Twenty-three papers were studied, the majority of which are short-term studies focused on the study of affect dynamics and the emotion-regulation function of NSSI. Implications of these results and recommendations for future research are discussed.

Keywords: self-harm, self-mutilation, experience sampling method, daily diary method.

Introduction

Non-suicidal self-injury (NSSI) has been defined as a direct and deliberate damage of body tissue without suicidal intent (Nock & Favazza, 2009). Traditionally, NSSI was considered a specific manifestation of borderline personality disorder (BPD). However this behavior is not specific to any diagnosis. It appears transdiagnostically, and can even be present in non-clinical populations. The greatest risk for NSSI behavior occurs in adolescence. The reported prevalence of NSSI in non-clinical samples is around 23% in adolescents, 13.4% in young adults, and 5.5% in adults (Swannell et., 2014).

NSSI and its related variables are frequently assessed retrospectively, both in cross-sectional and longitudinal studies. This approach introduces a memory bias and is less conducive to the understanding of the mechanisms involved in the maintenance, cessation, or aggravation of this behavior. Few studies have conducted a continuous follow-up of NSSI samples. This is required to establish the evolution of this behavior and the mechanisms that mediate the behavior. Ecological momentary assessment (EMA) enables us to cope with these difficulties, allowing for the gathering of real-time, real-world data, on certain behaviors, symptoms, and states of the subject, thus increasing data precision (Stone et al., 1999).

EMA does not represent a single methodology, much less a particular technology, but rather a collection of methods that share a daily diary approach to the individuals subjected to this type of investigation (Shiffman et al., 2008). Assessment scheduling in EMA can vary based on the study aim. So-called ‘event-contingent’ assessments are linked to events, such as occasions when the subject is about to undertake or has just undertaken a particular behavior (Reis & Gable, 2000). Another approach to EMA is to schedule assessments for certain times, which is known as ‘time-based assessments’

(Delespaul, 1995; Reis & Gable, 2000). This timing is sometimes scheduled at random to provide a representative and unbiased estimate of the typical state of the subjects (Bolger et al., 2003). Different modes of assessment can also be combined (Shiffman et al., 2008; Shiffman, 2014).

EMA may facilitate the testing of certain theories in relation to NSSI, an increasingly prevalent behavior. Thus, although suicidal behavior and NSSI are considered as different entities, both behaviors frequently coexist (Nock et al., 2006). In fact, NSSI seems to be an important risk factor for suicide after adjusting for other risk factors (Andover & Gibb, 2010; Whitlock et al., 2013). It has been hypothesized that NSSI is a gateway facilitating adolescents to attempt suicide (Grandclerc et al., 2016). However, the factual extent of this relation between NSSI and suicidal behavior, remains unclear. Accurate monitoring of NSSI with EMA could shed some light on this crucial area. Particularly important would be to identify the events recorded in the NSSI population that predict suicidal behavior or attempts during follow-up. Since self-monitoring of a behavior can decrease its frequency (Maas et al., 2013), EMA may represent a positive intervention on NSSI behavior. In addition, considering that mobile phones and new technologies are a central part of the lifestyle of adolescents, the major population at risk for NSSI, EMA methodology seems appropriate as a study tool.

EMA methods are used in several clinical psychology domains (Shiffman, 2008). However, studies in NSSI using this approach are scanty. Davidson et al. (2017) have reviewed the utilization of EMA in 5 studies on self-injurious behaviors of which only 3 are of a non-suicidal character (NSSI). In our paper, we have identified and reviewed 23 studies utilizing EMA in NSSI individuals. Such a deeper review is justified for several reasons: 1) NSSI should be isolated from 'deliberate self-harm', a category that includes

conditions unrelated to NSSI, such as suicidal ideation, and planning or attempting to commit suicide, 2) the concept of NSSI has evolved substantially in recent years and it has been included as a distinct syndrome among the 'Conditions for Further Study' section of the American Psychiatric Association (DSM-V), and 3) EMA is one of the most recently introduced evaluation methodologies in mental health sciences, and its value in a currently highly prevalent and worrisome behavior such NSSI, deserves a profound evaluation.

Our paper is aimed at reviewing the utilization and yield of EMA in populations exhibiting NSSI behavior. We will examine the methods employed and the current value and limitations of EMA to improve the understanding of NSSI. An important purpose of our review is to examine the diversity of manners in which EMA is applied in NSSI literature.

Methods

The present review was conducted in accordance with the PRISMA guidelines (Liberati et al., 2009). In table 1 we summarize the scope of our review.

Table 1

Eligibility criteria

Criteria	Operational definition
Object of study	Use of ecological momentary assessment in NSSI studies
Population	People engaged in NSSI. No reported cognitive impairment. No age restriction.
Type of study	Original scientific paper, indexed in PubMed or PsycInfo database before September 19, 2017
Language	Papers published in English or Spanish

Study Eligibility Criteria

Population

The criteria to define our target population were broad, to cope with the diversity of studies published so far. The target population included subjects who were engaged in NSSI, regardless of diagnosis or age. The only exclusion criterion was a cognitive impairment that could interfere with a self-monitoring of behavior, such as an IQ under 85, or a concomitant neurological disease.

Intervention / Assessment

The search was focused on studies reporting on the use of EMA in NSSI. Outcomes of the EMA assessment were not a selection criterion but the results of the subsequent self-monitoring were included in our final analysis.

Type of Study

Our only selection criterion was an EMA component in the samples of the selected studies. Our search has included original randomized and non-randomized clinical trials, and investigations following other designs (experimental, quasi-experimental, and descriptive studies). We have not incorporated in our study review articles (systematic and non-systematic) and meta-analyses. We did not impose any chronological restriction for the selection of studies to include as many of them as possible.

Search Strategy

To perform our search, we have used the electronic databases PubMed and PsycINFO. When these resources did not provide a full text version of the papers, we obtained them through the library resources of our institution. In all instances, we have had access to the full text version of the included papers. The last search was conducted on September 19, 2017. The strategies used when searching the literature are specified in Table 2.

As indicated, we have selected all original indexed papers in which the use of EMA in NSSI is explicitly mentioned, regardless of their comorbid diagnosis and their previous history of other self-injurious behaviors, including suicide. We have not considered papers solely referring to other behaviors, such as substance abuse, binge eating and vomiting, or suicidal ideation or attempts. Examples of excluded studies are those using EMA in relation to eating disorders (Lavender et al., 2013a; Lavender et al., 2013b), or BPD (Ellison, 2014), but not including NSSI behavior. We have also excluded studies initially appearing in our search but addressing totally unrelated topics (Bunning, 1998; Meany-Daboul et al., 2007; Özcan et al., 2015) and review papers without an original

investigation (Armey, 2012; Armey et al., 2015; Hamza & Willoughby, 2015; McKenzie, 2014). Finally, we excluded two other studies because their definition of 'self-harm' didn't include NSSI behavior (Evans, 1999; Humber, 2013).

Following an initial search, we performed a second-level exploration using the bibliographic references of papers identified in our primary quest that were related to the aim of our review. We used the same inclusion and exclusion criteria as those employed in the primary search.

Study Selection and Data Collection

To determine the eligibility of the studies, two authors (JC and LR) reviewed the abstracts of the selected papers, independently. When there was a disagreement, the inclusion or exclusion of the paper was decided by consensus. We then obtained the full text version of all studies that met the eligibility criteria. We extracted the following items by using predefined forms: aim of study, sample size and characteristics, EMA method employed, adherence of the subjects to EMA, and clinical outcomes. A data sheet covering these items was completed for each selected study (see Appendix). The same two authors completed the sheet for each selected study, independently. We then compared both sheets of each study, and disagreements were sorted out through consensus. Factors hypothesized to be associated with between-study heterogeneity included: primary research focus (NSSI, deliberate self-harm, or another behavior), assessed outcomes, mode of assessment, period of follow-up, and the presence of any kind of incentive for participation or completion of assessments.

Table 2

Search Strategy

	PsycINFO	PubMed
Search	*("NSSI" OR "nonsuicidal self directed violence" OR "self mutilation" OR "automutilation" OR "self-injury" OR "self-harm" OR "self-injurious behavior" OR "self-cutting")* ***AND*** *("Ecological Momentary Assessment" OR "experience sampling method" OR "ambulatory assessment" OR "intensive time sample" OR "momentary time sampling" OR "daily diary")*	*(("self mutilation"[Title/Abstract] OR"automutilation"[Title/Abstract] OR "self-injury"[Title/Abstract] OR "self-harm"[Title/Abstract] OR "self-injurious behavior"[Title/Abstract] OR "self-cutting"[Title/Abstract]))* ***AND*** *("Ecological Momentary Assessment" OR "experience sampling method" OR "ambulatory assessment" OR "intensive time sample" OR "momentary time sampling" OR "daily diary")*
Filters	Abstract	Title/Abstract
Last entry	9/19/2017	9/19/2017
Number of references	26	31

Results

We selected 23 articles from the 35 references found in the two searches (32 through the primary search and 3 following the second-level search). In Figure 1 we show the flow diagram for inclusion in our evaluation. Key aspects of selected studies are compiled in Table 3

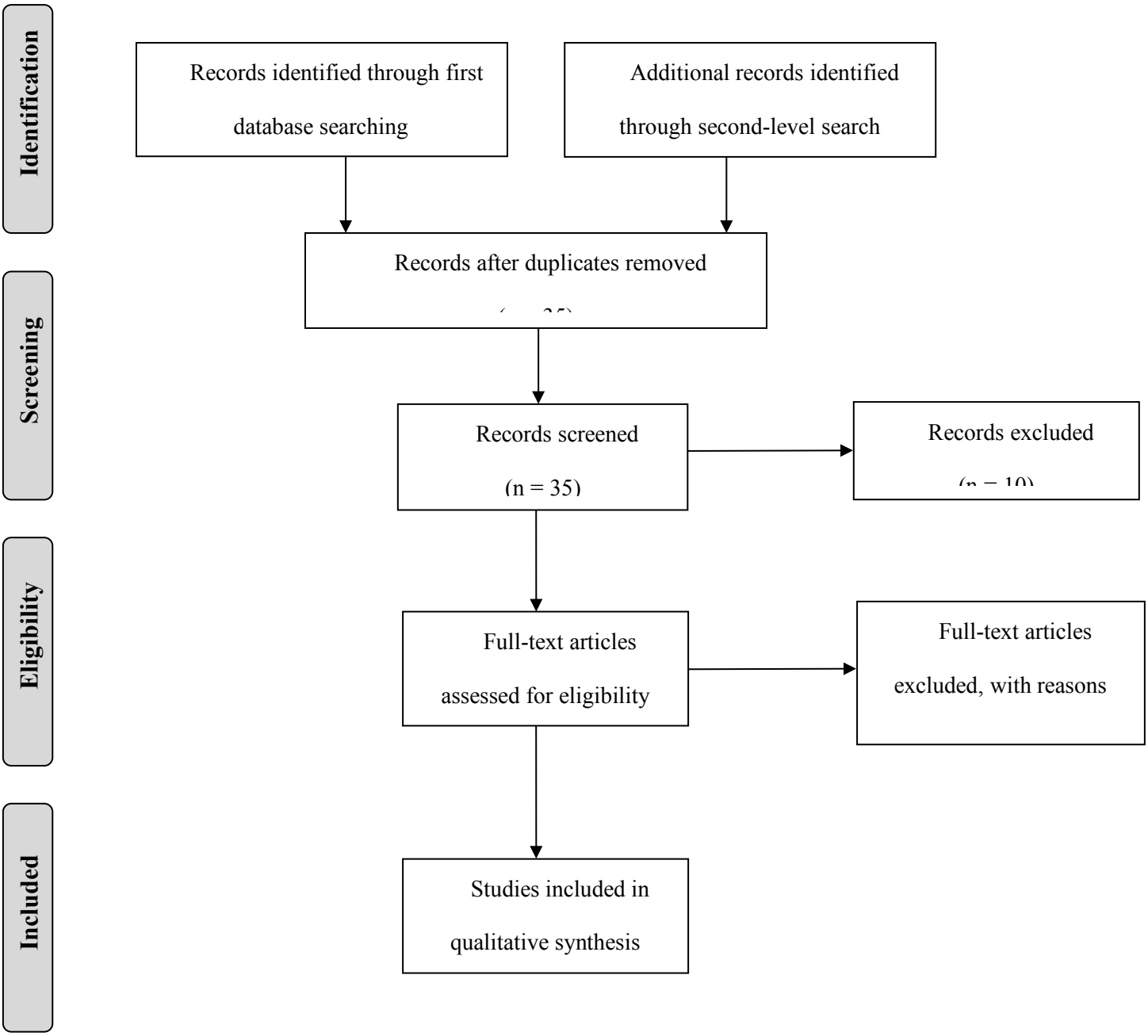

Figure1. Flow diagram of the inclusion of the studies from the literature search

Table 3

Selected studies

Authors	Population	Frequency and type of EMA	Duration of assessment	EMA measures
Ammerman et al., 2017	Adults with BPD and a comorbid depressive disorder	4 time contingent assessments per day	7 days	Self-injurious behavior, urge to hurt themselves, negative affect and emotional experiences of feeling impulsive
Andrewes et al., 2016 and Andrewes et al., 2017	Youth (15-25 years old) with BPD	6 time contingent assessments per day	6 days	Self-injurious thought and/or NSSI behavior (forms and context)
Anestis et al., 2012	Adults with Bulimia Nervosa (BN)	6 time semi random contingent assessments per day and event-contingent assessment when participants	14 days	Eating disorder and self-destructive behaviors, affect, mood, stress, and other behaviors

		experience behaviors from a set of behaviors listed		
Armey et al., 2011 and Armey et al., 2012	College students with a self-reported history of NSSI	6 time contingent assessments per day and event-contingent to NSSI	7 days	Affect, emotional experience, NSSI behavior
Bentley et al., 2017	Adults that meet criteria for NSSI disorder (DSM-V)	1 time contingent assessments per day and event-contingent assessment experience when NSSI occured	Up to 12 weeks	NSSI urges and acts
Bresin et al., 2013 and Bresin, 2014	College students with a self-reported history of NSSI	1 time contingent assessments	14 days	NSSI urges and acts, affect Unpleasent and pleasent events

Horowitz et al., 2017	Community young adults with a self-reported history of NSSI	1 time contingent assessments per day	21 days	NSSI urges or acts
Houben et al., 2017	Inpatient adults with BPD	10 time contingent assessments per day	8 days	Emotions, NSSI
Muehlenkamp et al., 2009	Adults with BN	7 time contingent assessments per day, event contingent assessment when participants experienced NSSI or other dysregulated behaviors	14 days	Mood, stressors, BN symptoms, self-injurious behaviors, momentary affect
Nock et al., 2009	Adolescents and young adults with a self-reported history of NSSI.	2 time contingent assessments per day and event-contingent assessment when	14 days	Suicide attempt, NSSI, Substance use, Binging, Purging , Impulsive Spending, Unsafe Sex (Function,

		participants experience self- directed violence thoughts or behaviors		Consequence, and Duration of NSSI)
Pearson et al., 2016	Adults with BN	1 time contingent assessments per day	14 days	Mood, eating disorder bahaviors, NSSI (form); substance misuse and reckless behaviors
Santangelo et al., 2016	Female adolescents with history of NSSI, and posible BPD (73% of the sample)	12 time contingent assessments per day	4 days	Affect, interpersonal states (attachment)
Shingleton et al., 2013	Adolescentes engaging in NSSI	event-contingent assessments when participants experienced	14 days	Suicide thoughts and behaviors, NSSI thoughts/behaviours, binge/ purge thoughts/behaviors, and

		self-destructive thoughts/behaviors.		'other' self-destructive thoughts/behaviors.
Turner et al., 2016a and Turner et al., 2016b and Turner et al., 2017	Adults with recent NSSI	1 time contingent assessments per day	14 days	NSSI urges, mood, conflict and perceived support. Binge eating, purging, and fasting behaviors. Social contact, coping strategies
Vansteelandt et al., 2017	Adults with BPD	10 time contingent assessments per day	8 days	Affect, NSSI occurrence
Victor et al., 2014	University students with recent history of NSSI and control group	1 time contingent assessments per day	14 days	NSSI behaviors (form and frequency), emotions
Wright et al., 2016	Adults with BPD	event-contingent assessments following	21 days	Mood, behavior, and interpersonal interactions including violence,

		every interpersonal interaction that lasted at least 10 minutes		substance use and self-harm during the interpersonal interactions
Zaki et al., 2013	Adults with BPD	5 time contingent assessments per day	21 days	Positive and negative emotions, NSSI acts and urges

As expected, most of studies were focused on the investigation of daily life variables that might influence the occurrence or maintenance of NSSI. To facilitate the understanding of the findings provided by EMA, we have grouped the results in different, not mutually exclusive, categories: context in which NSSI occurs (16 studies), motives that lead to NSSI (3 studies), emotional or social changed after the NSSI (7 studies), and other potential mechanisms that may influence or predict the behavior (8 studies).

Description of the Studies Selected

NSSI Context

We found multiple studies describing the context (including cognitions, emotions and situations) in which NSSI occurs. Only one study (Nock et al., 2009) was focused on pre-injury cognitions. This study was aimed at investigating the transition from self-injurious thoughts to self-injurious behaviors, revealing that the occurrence of NSSI was predicted by a greater intensity and shorter duration (1–30 min) of NSSI thoughts the opposite to the less prevalent suicidal thoughts.

Several studies examined the affective or emotional context of NSSI. Most of them describe a pre-injury increase in negative affect (NA) in different populations. Muehlenkamp et al. (2009) found a significant increase in NA and a decrease in positive affect (PA) prior to NSSI in patients diagnosed with bulimia nervosa (BN). Armey et al. (2011) also indicated that college students experienced increases in NA detectable hours before the NSSI event (M=7.82 h; S.D=8.32). Andrewes et al. (2016) found a pattern of increasing NA and decreasing PA prior to NSSI in a sample diagnosed with BPD, as well as an increase in negative complex emotions, defined as two or more co-occurring

negative emotions (Andrewes et al., 2017). Like Armey et al. (2011), they found that the changes in NA and PA occurred several hours before the engagement in the behavior (a median of 15 and 10 hours prior to NSSI, respectively). Victor & Klonsky (2014) reported that individuals engaging in NSSI experienced greater negative emotionality, particularly self-dissatisfaction, and to a lesser extent reduced positive emotions. These results were similar when controlling for Axis I psychopathology and BPD symptoms. Houben et al. (2017) and Wright et al. (2016) also found that an increased NA predicted a higher probability of NSSI in BPD patients and Turner et al. (2016b) found that NSSI days were marked by a more intense negative mood. Also related to NSSI engagement are emotional variability (Santangelo et al., 2016; Vansteelandt et al., 2017; Victor & Klonsky, 2014), and difficulties in emotional differentiation (Bresin, 2014; Victor & Klonsky, 2014; Zaki et al., 2013).

Some studies have examined the emotional context regarding NSSI thoughts in adolescents or young adult samples. Shingleton et al. (2013) found that worry and pressure precipitated both binging-purging (BP), and NSSI thoughts. Nock et al. (2009) encountered that NSSI thoughts occurred most often in the context of feeling sad or anxious, while NSSI behavior was significantly increased with feelings of rejection or anger, but decreased in the presence of feeling sad/worthless. Turner at al. (2016b) also found feelings of rejection in the context of NSSI behavior.

Regarding the environmental and relational context of NSSI, Andrewes et al. (2016), in a sample of young people diagnosed with BPD, found that, when asked openly, 46% declared to be unaware of what was happening just prior to engaging in NSSI. When the question was addressed offering several options, Nock (2009) found that being alone was

a significant predictor of NSSI in a sample of adolescents and young adults. Shingleton et al. (2013) studying the BP thoughts in NSSI adolescents reported that participants were more often with friends/peers when NSSI was combined with BP (40.5%) or BP only (50.0%) thoughts were present, compared to those experiencing NSSI-only (30.4%) thoughts. Santangelo et al. (2016) reported lower levels of attachment to the mother and best friend in NSSI adolescents as compared to normal controls. Turner et al. (2017) found that NSSI young adults as compared with a non-NSSI similarly aged group, had significantly less contact with their families and friends, and perceived less support after interactions with friends. In a previous study, Turner et al. (2016a) reported several important observations: 1) perceived support increased following NSSI when revealed to others, 2) that this support was associated with increased NSSI urges and greater likelihood of engaging in NSSI on the next day, and 3) participants revealing NSSI to others engaged in more frequent NSSI acts during a 2-week EMA period, than subjects not disclosing their behavior to others.

NSSI Motives

We found three studies that examined the explicit motives of NSSI as reported by the participants. When participants were explicitly asked about the reasons for their behavior after NSSI episodes, they most commonly reported engaging in NSSI to reduce their distress, but one-third of participants were unable to identify their motivations for this behavior (Andrewes et al., 2016). Shingleton et al. (2013) found that a desire to rid themselves of a thought/feeling was the most common reason. Nock et al., (2009) also found that intrapersonal-negative reinforcement was the most common function of the behavior, followed by intrapersonal-positive reinforcement and much less often for interpersonal reinforcement.

Changes Produced from Before to After NSSI

Various studies have explored the role of changes in affect just prior to and directly after NSSI behavior. Armey et al. (2011), Andrewes et al. (2016) and Andrewes et al. (2017) found a decrease in NA after NSSI engagement. However, Houben et al. (2017) have encountered an increase in negative emotions after NSSI engagement. Andrewes et al. (2016) and Muehlenkamp et al. (2009), reported on an increase in PA after NSSI, although the latter did not find changes in NA after NSSI.

Only the study of Turner et al., (2016a) has examined the issue of variations related to social response after NSSI. As mentioned above, these investigators found that participants perceived an increased support following NSSI acts when the latter were revealed to others. However this increased perceived support was associated with stronger NSSI urges and an increased risk for a repeat episode on the following day. Interpersonal conflict did not decrease following NSSI, regardless of whether these acts were revealed to others or not.

Other Potential Mechanisms

Aside from the implication of affect, some studies have tested for the influence of other variables on NSSI behavior. These studies generally combine EMA measures and traditional measures of different variables.

Bresin et al. (2013) an Ammerman et al. (2017) examined the relation between affect and impulsivity in NSSI. Bresin et al. (2013) found that impulsivity and daily sadness predicted an urge to engage in NSSI. However, in participants with a low impulsivity,

sadness was unrelated to NSSI urge. Ammerman et al. (2017) found that urges to hurt oneself and impulsive urges, but not daily NA or aggressive urges, predicted NSSI. They also found that low levels of distress tolerance (behavioral measure) was a stronger predictor of NSSI behavior than daily experiences. Zaki et al. (2013) in a sample of patients with BPD found that rumination predicted higher rates of NSSI acts and urges in subjects who had difficulties differentiating their negative emotions.

EMA has been applied not only for assessing the occurrence of NSSI but also for evaluating the frequency or severity of this behavior according to different mechanisms. In females diagnosed of bulimia nervosa, affective lability and past suicidal behavior were significantly related to the number of NSSI episodes as disclosed with an EMA methodology (Anestis et al., 2012). High levels of cumulative life trauma also evidenced greater in vivo NSSI severity following both high and low levels of NA (Armey et al., 2012). Trauma severity has also been related with a wider range of NSSI functions and with specific NSSI functions like interpersonal boundaries purposes and anti-dissociation aims (Horowitz et al., 2017).

EMA methodology has also been employed to examine the effect of psychological interventions on the reduction of NSSI episodes. Bentley et al. (2017) reported fewer NSSI urges and acts after emotion-focused interventions.

Finally, we have found only one study addressing the association between higher-order personality traits and NSSI using EMA (Pearson et al., 2016). This investigation concluded that higher-order personality factors, which were strongly associated with engagement in substance misuse, did not show relation with NSSI behavior or other risky

behaviors.

Discussion

Our review of 23 original studies using EMA in NSSI engaged populations shows that daily diary approaches provide valuable new information in real time on the links between this behavior and an ample number of variables such as context, emotional states, personality traits, trauma, social and emotional relations…etc.

EMA studies have been mainly focused on the emotional, rather than on the cognitive or situational contexts. These investigations have revealed a trend for an increment in NA levels before NSSI engagement. This suggests that the NSSI behavior may entail an emotion-regulation function (Nock, 2010). In addition, Andrewes et al (2016) and Armey (2011) have studied with EMA the accurate timing of events, showing that changes in affect take place hours before NSSI episodes, thus providing an opportunity to design potential preventive interventions.

It is of interest to note that NSSI thoughts and NSSI behaviors appear in different contexts. While thoughts tend to be elicited in relation to feelings of sadness and anxiety (Nock et al., 2009; Shingleton et al., 2013) the NSSI behavior appears more frequently in solitude (Nock et al., 2009) and in associated with feelings of rejection (Nock et al. 2009; Turner at al., 2016b), or anger (Nock et al. 2009). These findings indicate that the concept of 'negative affect' is too broad and that emotional, cognitive and situational contexts must be defined more specifically to identify the reasons conducting to the jump from thoughts to behaviors.

Several studies have shown an intrapersonal negative reinforcement as the most frequent motive for NSSI when the motivations were explicitly examined after NSSI engagement (Andrewes et al., 2016; Nock et al., 2009; Shingleton et al. 2013). This is in consonance with investigations that have found a decrease of negative affect after NSSI engagement (Andrewes et al. 2016; Andrewes et al. 2017 and Armey, 2011). In contrast, Houben (2017) found an invigoration of negative emotions after NSSI engagement. However, the study of Houben differs from the others in two aspects: 1) it is the only one carried out in a sample of inpatients in whom NSSI behavior is likely to be reprimanded; 2) the frequency of assessments was 10 times per day, higher than in the other aforementioned investigations.

A few studies have examined PA changes after NSSI suggesting a positive reinforcement function of NSSI (Andrewes et al., 2016; Muehlenkamp et al., 2009; Turner et al., 2016a). This area should be explored further. NSSI behavior may have similarities with addiction mechanisms in which a positive reinforcement plays a role in the initial stages, and a negative reinforcement prevails in subsequent phases.

Most of the studies analyzed here have focused on the evaluation of affect or emotion when applying EMA. In the last section of the results, we describe some studies also considering the influence of other distal and proximal variables that may influence NSSI behavior. Several studies have established that certain mediating and moderating variables are necessary to explain the behavior beyond affective factors, such us impulsivity (Ammerman et al., 2017 & Bresin et al., 2013), rumination (Zaki et al., 2013), or significant distal events (Anestis et al., 2012; Armey et al., 2012).

NSSI social functions and correlates have not been extensively studied, though they play an important role in the initiation, maintenance, and cessation of NSSI. In our review we found that lower levels of attachment to the mother and best friend (Santangelo et al. 2016), lower social contact with family and friends, and lower perceived support after interactions (Turner et al., 2017), were related to NSSI occurrence. Turner et al., (2016a) found that NSSI acts revealed to others increased the perceived support in contrast to unrevealed NSSI acts; however, the larger perceived support after NSSI increased NSSI urges and acts. The latter may occur because the NSSI act exerts a positive reinforcement function. A negative reinforcement probably plays no role since in this study, independently of whether these acts were revealed to others or not, the interpersonal conflict did not decrease following NSSI behavior (Turner et al., 2016a). Two non-EMA studies also indicate that NSSI individuals disclose their behavior to others. Muehlenkamp et al. (2013) found that 59% of individuals with repetitive NSSI episodes revealed to others their behavior despite reporting low perceived social support from family members, and few individuals from whom to seek advice. Baetens et al. (2011) also found that more than half of an NSSI sample communicated their behavior to someone else.

Many NSSI subjects have difficulties reporting the motives of their behavior (Andrewes et al., 2016). Others have found that in 65% of NSSI episodes, adolescents reported an intrapersonal- negative reinforcement motive, followed by intrapersonal-positive (25%), and much less often for the purposes of interpersonal-negative (15%) and interpersonal-positive (4%) reinforcement (Nock 2009). It is possible that participants have difficulties in recognizing the relation between NSSI and an ultimate intention to generate changes in their social environment. In some cases, regulation of affective

experience and social situations can coexist and then, the social function of NSSI might be obscured by the emotion-regulation function when the participant is invited to reply to a questionnaire. While the EMA methodology can use fixed inquiry forms, it also allows us to study the precipitants and the effects of certain behaviors without explicitly providing predefined answers to the questions. This approach should be considered in future studies to explore the social function of NSSI, assessing familial and other interpersonal factors related to NSSI behavior.

As mentioned before, NSSI rates in adolescents are high and occur in both clinical and non-clinical samples. We know that self-injurious thoughts and behaviors are more prevalent among adolescents than in adults (Nock, 2010). However, it should be noted that only five of the studies meeting our inclusion criteria recruited adolescents in the sample, and only two of them involved adolescents exclusively. Given the lack of representation of adolescents in the current literature, it is difficult to compare them with the adult population. More studies on adolescents with NSSI behavior are badly needed. Given the importance of interpersonal and familiar relations in adolescence, the social function of NSSI might be more relevant in this young population than in adulthood.

We did not find meaningful differences between clinical and non-clinical samples. Indeed, some of the main findings such as a trend for increased NA before NSSI engagement appeared in both clinical and non-clinical populations. As Victor and Klonsky (2014) reported that when controlling for Axis I psychopathology and BPD symptoms, the greater rates of negative emotionality and lower positive emotions in NSSI subjects as compared to controls, were maintained. It is possible that these so-called non-clinical samples include more subjects with psychopathology than it is expected.

EMA methodology utilized in the studies included in this review was not uniform (Table 3). The number of daily assessments varied from 1 to 12 and their duration from 4 days to up to 12 weeks. The adherence of the recruited subjects was not reported in all studies. Information from papers mentioning the adherence to EMA assessment indicates that the lowest figures were found in a non-clinical sample of college students (compliance rate 38%), (Armey et al., 2011). Relatively low figures of adherence were also found in studies requesting more than six assessments per day and when participants were not remunerated according to the degree of compliance (Andrewes et al., 2016; Andrewes et al., 2017; Armey et al., 2011 and Vansteelandt et al., 2017). However, studies that implied longer periods of assessment did not conveyed lower adherence (Bentley et al., 2017; Horowitz et al., 2017; Wright et al., 2016 and Zaki et al., 2013).

Studies performed in adolescent NSSI individuals are not only scarce, but also have consisted of small sample sizes. In the studies reviewed the recruited individuals were predominantly females. The majority of the EMA and diary studies so far reviewed employed short assessment periods. New studies recruiting lager samples of adolescents and with longer periods of follow-up are needed to understand NSSI better and to develop strategies to address this behavior. The use of smart-phones rather than other alternatives to complete the questionnaires may contribute to increase the compliance rate in this age population. Also of consideration is the number and the timing of assessments demanded per day using EMA to achieve a high compliance rate. Finally, we should seek information on the relations between NSSI and other self-aggressive conducts as well as the risk of progression to more dangerous behaviors such suicidal ideation, planning or attempt.

All these new investigations using EMA in NSSI could have relevant clinical implications as they may allow professionals to act effectively according to certain warning signals. The adoption of EMA methodology for NSSI individuals may help clinicians to monitor their interventions, and help patients to be more conscious of their own processes.

Regarding the limitations of this study, it is worth noting the heterogeneity among the studies. The wide inclusion criteria adopted in this review have increased the variability among methodologies and in the specific aims of the studies. The primary research focus was NSSI, but some studies included other self-injurious behaviors or thoughts. However, the different behaviors were well-defined and differentiated from NSSI. Regarding the content of the studies, between-study heterogeneity included sample sizes and characteristics, variability in assessed outcomes, mode of implementing EMA, period of assessment and follow-up, adherence, and additional diagnoses. While this variability does not enable us to draw generalizable conclusions, our selection criteria allowed us to include a higher number of studies and reach the main objective of this review, which was to examine the current state of NSSI study through EMA.

In conclusion, EMA is a valuable tool in the study of NSSI, and one that has already revealed interesting data in this area. However, the number of studies implementing this methodology is still scarce. Most of the studies are focused on the investigation of the context in which NSSI occurs, use EMA in a short-term basis, have recruited small samples, and the representation of the adolescents population is very insufficient. We need powered, long-term prospective EMA studies, including different NSSI populations,

particularly adolescents. This is crucial if we want to identify reliable predictors of progression to more risky behaviors and strategies to modify worrisome dysfunction.

References

Ammerman, B. A., Olino, T. M., Coccaro, E. F., & McCloskey, M. S. (2017). Predicting Nonsuicidal Self-Injury in Borderline Personality Disorder Using Ecological Momentary Assessment. *Journal of Personality Disorders*, 10, 1-12.

Andover, M. S., & Gibb, B. E. (2010). Non-suicidal self-injury, attempted suicide, and suicidal intent among psychiatric inpatients. *Psychiatry Research*, 178(1), 101-105.

Andrewes, H. E., Hulbert, C., Cotton, S. M., Betts, J., & Chanen, A. M. (2016). Ecological Momentary Assessment of Nonsuicidal Self-Injury in Youth With Borderline Personality Disorder. *Personality Disorders: Theory, Research, and Treatment*. Advance online publication

Andrewes, H. E., Hulbert, C., Cotton, S. M., Betts, J., & Chanen, A. M. (2017). An ecological momentary assessment investigation of complex and conflicting emotions in youth with borderline personality disorder. *Psychiatry Research*, 252, 102–110.

Anestis, M. D., Silva, C., Lavender, J. M., Crosby, R. D., Wonderlich, S. A., Engel, S. G., & Joiner, T. E. (2012). Predicting nonsuicidal self-injury episodes over a discrete period of time in a sample of women diagnosed with bulimia nervosa: An analysis of self-reported trait and ecological momentary assessment based affective lability and previous suicide attempts. *International Journal of Eating Disorders*, 45(6), 808-811.

Armey, M. F., Crowther, J. H., & Miller, I. W. (2011). Changes in ecological momentary

assessment reported affect associated with episodes of nonsuicidal self-injury. *Behavior Therapy*, 42(4), 579–588.

Armey, M. F. (2012). Ecological momentary assessment and intervention in nonsuicidal self-injury: A novel approach to treatment. *Journal of Cognitive Psychotherapy*, *26*(4), 299–317.

Armey, M. F., Nugent, N. R., & Crowther, J. H. (2012). An exploratory analysis of situational affect, early life stress, and non-suicidal self-injury in college students. *Journal of Child and Adolescent Trauma*, 5, 327-343.

Armey, M. F., Schatten, H. T., Haradhvala, N., & Miller, I. W. (2015). Ecological momentary assessment (EMA) of depression-related phenomena. *Current Opinion in Psychology,* 4, 21–25.

Baetens, I., Claes, L., Muehlenkamp, J., Grietens, H., & Onghena, P. (2011). Non-Suicidal and Suicidal Self-Injurious Behavior among Flemish Adolescents: A Web-Survey. *Archives of Suicide Research*, 15(1), 56–67.

Bentley, K. H., Nock, M. K., Sauer-Zavala, S., Gorman, B. S., & Barlow, D. H. (2017). A functional analysis of two transdiagnostic, emotion-focused interventions on nonsuicidal self-injury. *Journal of Consulting and Clinical Psychology*, *85*(6), 632–646.

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: capturing life as it is lived". *Annual Review of Psychology*, 54, 579–616.

Bresin, K. (2014). Five indices of emotion regulation in participants with a history of nonsuicidal self-injury: A daily diary study. *Behavior Therapy*, 45, 56–66.

Bresin, K., Carter, D. L., & Gordon, K. H. (2013). The relationship between trait impulsivity, negative affective states, and urge for nonsuicidal self-injury: A daily

diary study. *Psychiatry Research*, 205, 227–231.

Bunning, K. (1998). To engage or not to engage? Affecting the interactions of learning disabled adults. *International Journal of Language & Communication Disorders, 33(Suppl),* 386–391.

Davidson, C.L., Anestis, M. D., & Gutiérrez, P. M. (2017). Ecological momentary assessment is a neglected methodology in suicidology. *Archives of Suicide Research,* 21(1), 1-11.

Delespaul, P (1995). *Assessing Schizophrenia in Daily Life: The Experience Sampling Method*. Maastricht, The Netherlands: Maastricht Univ. Press

Díaz de Neira, M. (2014). *Características psicopatológicas, acontecimientos vitales estresantes y conductas autolesivas suicidas y no suicidas en adolescentes evaluados en salud mental.* Universidad Autónoma de Madrid, Madrid.

Ellison, W. D. (2014). Using dynamic factor analysis to model intraindividual variation in borderline personality disorder symptoms. ProQuest Information & Learning, US.

Evans, K., Tyrer, P., Catalan, J., Schmidt, U., Davidson at al. (1999). Manual-assisted cognitive-behaviour therapy (MACT): a randomized controlled trial of a brief intervention with bibliotherapy in the treatment of recurrent deliberate self-harm. *Psychological Medicine*, 29(1), 19–25.

Grandclerc, S., Labrouhe, D. D., Spodenkiewicz, M., Lachal, J., & Moro, M.-R. (2016). Relations between Nonsuicidal Self-Injury and Suicidal Behavior in Adolescence: A Systematic Review. *PLOS ONE*, *11*(4).

Hamza, C. A., & Willoughby, T. (2015). Nonsuicidal self-injury and affect regulation: recent findings from experimental and ecological momentary assessment studies and future directions. *Journal of Clinical Psychology*, 71(6), 561–574.

Horowitz, S., & Stermac, L. (2017). The relationship between interpersonal trauma history and the functions of non-suicidal self-injury in young adults: An experience sampling study. Journal of Trauma & Dissociation: The Official *Journal of the International Society for the Study of Dissociation (ISSD),* 1–15.

Houben, M., Claes, L., Vansteelandt, K., Berens, A., Sleuwaegen, E., & Kuppens, P. (2017). The emotion regulation function of nonsuicidal self-injury: A momentary assessment study in inpatients with borderline personality disorder features. *Journal of Abnormal Psychology,* 126(1), 89–95.

Humber, N., Emsley, R., Pratt, D., & Tarrier, N. (2013). Anger as a predictor of psychological distress and self-harm ideation in inmates: A structured self-assessment diary study. *Psychiatry Research, 210(1),*

Klonsky, E. D. (2007). The functions of deliberate self-injury: a review of the evidence. *Clinical Psychology Review*, 27(2), 226–239.

Lavender, J. M., De Young, K. P., Wonderlich, S. A., Crosby, R. D., Engel, S. G. et al. (2013). Daily patterns of anxiety in anorexia nervosa: Associations with eating disorder behaviors in the natural environment. *Journal of Abnormal Psychology*, 122(3), 672–683.

Lavender, J. M., Wonderlich, S. A., Crosby, R. D., Engel, S. G., Mitchell, J. E. et al. (2013). Personality-based subtypes of anorexia nervosa: Examining validity and utility using baseline clinical variables and ecological momentary assessment. *Behaviour Research and Therapy*, *51*(8), 512–517.

Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., G unctions of deliberate self-injury: a review of the evi.J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health

care interventions: explanation and elaboration. *BMJ (Clinical Research Ed.)*, 339, b2700.

Maas, J., Hietbrink, L., Rinck, M., & Keijsers, G. P. J. (2013). Changing automatic behavior through self- monitoring: Does overt change also imply implicit change?. *Journal of Behavior Therapy and Experimental Psychiatry,* 44, 279-284.

McKenzie, K. C. (2014). Non-suicidal self-injury: An emotion regulation perspective. ProQuest Information & Learning, US.

Meany-Daboul, M. G., Roscoe, E. M., Bourret, J. C., & Ahearn, W. H. (2007). A Comparison of Momentary Time Sampling and Partial-Interval Recording for Evaluating Functional Relations. *Journal of Applied Behavior Analysis*, 40(3), 501–514.

Muehlenkamp, J., Brausch, A., Quigley, K., & Whitlock, J. (2013). Interpersonal features and functions of nonsuicidal self-injury. *Suicide & Life-Threatening Behavior*, 43(1), 67-80.

Muehlenkamp, J. J., Engel, S. G., Wadeson, A., Crosby, R. D., Wonderlich, S. A., Simonich, H., & Mitchell, J. E. (2009). Emotional states preceding and following acts of non-suicidal self-injury in bulimia nervosa patients. *Behaviour Research and Therapy*, 47(1), 83-87.

Nock, M.K. (2010). Self-injury. *Annual Review of Clinical Psychology*, 6, 339-363.

Nock, M. K., & Favazza, A. R. (2009). Nonsuicidal self-injury: Definition and classification. In M. K. Nock (Ed.), *Understanding nonsuicidal self-injury. Origins, assessment and treatment* (pp. 9–18). Washington, DC: American Psychological Association.

Nock, M. K., Joiner, T. E., Gordon, K. H., Lloyd-Richardson, E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: diagnostic correlates and relation to suicide attempts. *Psychiatry Research*, 144(1), 65-72.

Nock, M. K., Prinstein, M. J., & Sterba, S. K. (2009). Revealing the form and function of self-injurious thoughts and behaviors: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology*, 118(4), 816–827.

Olfson, M., Gameroff, M., Marcus, S., Greenberg, T., & Shaffer, D. (2005). National Trends in Hospitalization of Youth With Intentional Self-Inflicted Injuries. *American Journal of Psychiatry*, 162(7),1328-1335.

Özcan, N. K., Bilgin, H., Akın, M., & Badırgalı Boyacıoğlu, N. E. (2015). Nurses' attitudes towards professional containment methods used in psychiatric wards and perceptions of aggression in Turkey. *Journal of Clinical Nursing*, 24(19–20), 2881–2889.

Pearson, C. M., Pisetsky, E. M., Goldschmidt, A. B., Lavender, J. M., Wonderlich et al. (2016). Personality psychopathology differentiates risky behaviors among women with bulimia nervosa. *International Journal of Eating Disorders*, *49*(7), 681–688.

Reis, H. T., & Gable, S. L. (2000). Event-sampling and other methods for studying everyday experience. In H. T. Reis, C. M. Judd, H. T. Reis, C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 190–222). New York, NY US: Cambridge University Press.

Santangelo, P. S., Koenig, J., Funke, V., Parzer, P., Resch, F., Ebner-Priemer, U. W., & Kaess, M. (2016). Ecological Momentary Assessment of Affective and

Interpersonal Instability in Adolescent Non-Suicidal Self-Injury. *Journal of Abnormal Child Psychology*.

Shiffman, S. (2014). Conceptualizing Analyses of Ecological Momentary Assessment Data. *Nicotine & Tobacco Research*, *16*(Suppl 2), S76-S87.

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology*, 4, 1-32.

Shingleton, R. M., Eddy, K. T., Keshaviah, A., Franko, D. L., Swanson, S. A., Yu, J. S., Krishna, M., Nock, M.K & Herzog, D. B. (2013). Binge/purge thoughts in nonsuicidal self-injurious adolescents: an ecological momentary analysis. *International Journal of Eating Disorders*, *46*(7), 684–9.

Stone, A. A., Shiffman, S. S., & DeVries, M. W. (1999). Ecological momentary assessment. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: The foundations of hedonic psychology* . New York: Russell Sage Foundation.

Swannell, S. V., Martin, G. E., Page, A., Hasking, P., & St John, N. J. (2014). Prevalence of nonsuicidal self-injury in nonclinical samples: systematic review, meta-analysis and meta-regression. *Suicide & Life-Threatening Behavior*, *44*(3), 273-303.

Turner, B. J., Cobb, R. J., Gratz, K. L., & Chapman, A. L. (2016a). The role of interpersonal conflict and perceived social support in nonsuicidal self-injury in daily life. *Journal of Abnormal Psychology*, *125*(4)

Turner, B. J., Wakefield, M. A., Gratz, K. L., & Chapman, A. L. (2017). Characterizing interpersonal difficulties among young adults who engage in nonsuicidal self-injury using a daily diary. *Behavior Therapy,* 48(3), 366–379.

Turner, B. J., Yiu, A., Claes, L., Muehlenkamp, J. J., & Chapman, A. L. (2016b). Occurrence and co-occurrence of nonsuicidal self-injury and disordered eating in

a daily diary study: Which behavior, when? *Psychiatry Research*, *246*, 39–47.

Vansteelandt, K., Houben, M., Claes, L., Berens, A., Sleuwaegen, E., Sienaert, P., & Kuppens, P. (2017). The affect stabilization function of nonsuicidal self-injury in Borderline Personality Disorder: An Ecological Momentary Assessment study. *Behaviour Research and Therapy*, *92*, 41–50.

Victor, S. E., & Klonsky, E. D. (2014). Daily emotion in non-suicidal self-injury. *Journal of Clinical Psychology*, 70, 364–375.

Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Baral Abrams, G., Barreira, P., & Kress, V. (2013). Nonsuicidal self-injury as a gateway to suicide in young adults. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, *52*(4), 486-492.

Wright, A. G. C., Hallquist, M. N., Stepp, S. D., Scott, L. N., Beeney, J. E., Lazarus, S. A., & Pilkonis, P. A. (2016). Modeling heterogeneity in momentary interpersonal and affective dynamic processes in borderline personality disorder. Assessment, 23(4), 484–495.

Zaki, L. F., Coifman, K. G., Rafaeli, E., Berenson, K. R., & Downey, G. (2013). Emotion differentiation as a protective factor against nonsuicidal self-injury in borderline personality disorder. *Behavior Therapy*, 44, 529–540.

6.1.3. Use of Ecological Momentary Assessment (EMA) in Non-Suicidal Self-Injury (NSSI): A systematic review

Abstract

Introduction: Electronic Ecological Momentary Assessment (EMA) can provide precise information regarding day-to-day functioning of patients overcoming some of the limitations of usual clinical evaluation; however adherence to this methodology might be a major threat. Research and application of EMA concerning clinical settings remains scant. Our goal was to study the user profiles of EMA in a clinical sample of adolescents.

Material and methods: 209 adolescents following an outpatient mental health treatment accepted to use EMA. They were evaluated in different sociodemographic and clinical variables as well as the use that they made of EMA.

Results: 39.7% of patients were considered users and 60.3% non-active users. Certain self-harm behaviors were more common in the group of active users, while hyperkinetic disorders were more common in the group of non-active users. A regression analysis revealed that non-suicidal self-injury (OR=2.99) and hyperkinetic disorders (OR=0.51) were related to the use of EMA.

Conclusion: This preliminary study adds novel and promising information about EMA use in clinical practice. Adolescents with self-harm behaviors EMA seem more prone to use this tool. Our study provides support for actively monitoring self-harm behaviors with EMA. Future studies might consider a comprehensive analysis of adherence and EMA data collection

Keywords: Ecological Momentary Assessment, self-harm, adolescence, clinical sample, user profiles.

Resumen

Introducción: la Evaluación Momentánea Ecológica electrónica (EME) puede proporcionar información precisa con respecto al funcionamiento cotidiano de los pacientes superando algunas de las limitaciones de la evaluación en la clínica habitual. Sin embargo, la adherencia de los pacientes a esta metodología puede ser complicada. La investigación y aplicación de la EME en entornos clínicos sigue siendo escasa. Nuestro objetivo fue estudiar los perfiles de usuario de EME en una muestra clínica de adolescentes.

Material y métodos: 209 adolescentes en seguimiento en un centro ambulatorio de salud mental aceptaron usar EME. Se evaluaron diferentes variables sociodemográficas y clínicas de los pacientes además del uso que hicieron de la herramienta.

Resultados: el 39,7% de los pacientes fueron consideraron usuarios y el 60,3% usuarios no activos. Ciertas conductas autolesivas fueron más comunes en el grupo de usuarios activos, mientras que los trastornos hipercinéticos fueron más comunes en el grupo de usuarios no activos. Un análisis de regresión reveló que las autolesiones no suicidas (OR = 2,99) y los trastornos hipercinéticos (OR = 0,51) estaban relacionados con el uso de EME.

Conclusión: Este estudio preliminar añade información novedosa y prometedora sobre el uso de EME en la práctica clínica. Los adolescentes con conducta autolesiva parecen ser más propensos al uso de esta herramienta lo que refuerza la idea de utilizar EME de forma activa para monitorear esta conducta. En futuros estudios se considerará el análisis exhaustivo de la adherencia y la recopilación de datos de EMA.

Palabras clave: Evaluación Ecológica Momentanea, autolesión, adolescencia, muestra clínica, perfil de usuario.

Introduction

Ecological Momentary Assessment (EMA) is an evaluation method that consists in the collection of certain behaviors, symptoms, and states of the subject in real-time (or shortly after) and in their day-to-day life. This method can help us to better understand and even predict certain behaviors overcoming some of the limitations of usual clinical evaluation in which time with subjects is limited and the information is generally collected retrospectively [1].

EMA is not a single method, much less a particular technology, but a collection of methods that share the aforementioned characteristics [1]. Assessment scheduling in EMA can vary based on the study aim. So-called 'event-contingent' assessments are linked to events, such as occasions when the subject is about to undertake or has just undertaken a particular behavior [2]. Another approach to EMA is to schedule assessments for certain times, which is known as 'time-based assessments' [2].

Methods of assessment can range from the use of paper and pencil to the use of the most advanced technologies. The use of new technologies such as web-based methodology is replacing conventional methods (paper version) [3]. This implies a greater precision and realism of data since they permit the verification of the time of entry, which implies a more detailed analysis of compliance.

Compliance seems to be better when using new technologies [1, 4, 5] and preference for electronic versus more traditional paper diaries has been found even in older subjects. Electronic EMA has been successfully applied in different populations such us low socioeconomic status patients [7] and subjects with psychiatric disorders such as psychosis

[8, 9], affective disorders [10, 11] , substance use disorders [1,12] or self-injurer populations [13] among others. However, subject self-reports required from some EMA and the rejection towards new technologies of some subjects are major threats to electronic EMA adherence.

Adolescents might be considered a target population for electronic EMA since they are very prone to use new technologies such as mobile phone applications although there is still scant literature regarding adherence to EMA on this population. Electronic EMA seems a powerful tool to use with subjects who engage in risky behaviors that start during adolescence and that are frequent in clinical population such as self-harm behaviors [14]. These behaviors are not always reported during face-to-face consultation. However, evidence suggests that self-harming youth make more use of new technologies (social networks) and that they are utilized as a medium to communicate with and to seek social support from others [15].

A recent review about compliance with mobile EMA protocols in children and adolescents found an average compliance rate of 78%, not finding differences between clinical and non-clinical samples [16]. The average compliance in this review is defined as suboptimal and it is under adult's compliance found in other review studies, which is over 80% [17, 18]. In their review [16] they included 42 studies but only four studies were carried out on mental health samples. The aim of the study was the examination of the relationship between adolescent compliance and study design factors such as length of EMA protocols and sampling frequency. Some of the studies also took into account the influence of some personal variables such as age [19, 20, 21, 22,23] gender [19, 20, 22, 23, 24, 25], disease status [19, 20, 21, 22,

[23, 24] or intelligence quotient (IQ) [23]. From these variables only IQ was positively associated with compliance [23].

Apart from analyzing EMA design factors related to adherence to this methodology, it is also important to specifically examine which personal factors are related to the usage of electronic EMA assessment. Barrigon et al. [26] carried out a study concerning this issue in adult clinical population finding that active users were younger and more frequently diagnosed with anxiety related disorders than non-active users. They were more likely to report thoughts about death and suicide and had experienced more stressful life events than non-active users. Rickwood et al. [27] tried to provide a comprehensive profile of young people seeking web-based mental health support instead of face-to-face. They found that more web-based mental health support users were female and they tended to be older. They also found that a higher percentage of web-based support users presented high or very high levels of psychological distress, but they were at an earlier stage of illness on other indicators of clinical presentation compared with center-based counseling clients.

Although EMA has gained broad acceptability in research in the last years, there is little knowledge concerning clinical practice and user profiles. To the best of our knowledge the study of Barrigon et al. [26] is the only one that specifically studies this issue, and there are not studies regarding this issue in clinical adolescent population. Examining clinical and demographic profiles of adolescents who will and won't respond to EMA would add knowledge to the present literature. Additionally, it might help in research and clinical practice with adolescents since it would allow us to apply EMA in a more targeted and efficient way. It would have important benefits in clinical practice, in which time

with patients is limited. Regarding clinical characteristics we hypothesize that patients diagnosed with hyperkinetic disorders (International Classification of Diseases, 10th revision –ICD-10–) might be less inclined to use EMA since the avoidance of mental effort and the emotional dysregulation typical of these disorders might interfere the use of EMA [28]. Given that adult active users were more likely to report thoughts about death and suicide than non-active users in a clinical sample [26] and concerning the study about the frequent use of new technologies in self-harming youth [15], we hypothesize that adolescents reporting self-harm ideas or behaviors, including NSSI, will be more active in the use of EMA.

As we mentioned before, adolescents might be a target population for EMA use; however, it is important to describe how it can be tailored to characteristics of the patient and applied efficiently. The aim of this study is to determine the sociodemographic and clinical differences between users and non-active users of a new electronic EMA tool in a sample of adolescents followed in outpatient mental health services.

Material and methods

Participants

Subjects were recruited from the Child and Adolescent Outpatient Psychiatric Services of Jiménez Díaz Foundation and Infanta Elena University Hospitals (Madrid, Spain) from November 1st 2015 to October 31st 2018. The sample of patients who were offered the use of EMA was consecutive. After describing the study, written informed consent was obtained from patients and parents or legally authorized representatives who agreed to participate. Subjects under 12 years old, subjects over 18 years old, and/or those who

lacked the capacity to comprehend the questionnaires used in this study were excluded. The Jiménez Díaz Foundation Ethics Committee approved the study.

Instruments and Procedure

Questionnaires and other clinical information were registered using "MeMind" (www.memind.net) a web application that was developed to merge different data sources, including patient and caregiver inputs. The MeMind application had two interfaces, one for clinicians: the "electronic health record (EHR) view" and another for patients: the "EMA view". The EMA view was also available as a mobile phone application (MeMind).

Clinicians made a first evaluation collecting the following information in the EHR: sociodemographic data, stressful life events and psychosocial problems, ICD-10 mental disorder diagnoses [29], illness severity measured by the Clinical Global Impression scale -CGI- [30] and the Children's Global Assessment Scale -CGAS- [31], and questions regarding any lifetime self-harm thoughts or behaviors: NSSI, thoughts about suicide, suicide plans and suicide attempts.

After the clinician's part was filled out, EMA view for patients was activated. Patients were given a user number and a password in order to access MeMind. They had to complete the following questionnaires the day in which EMA was first activated: the 5-item World Health Organization Well-Being Index (WHO-5) [32] as a measure of subjective psychological well-being, General Health Questionnaire (GHQ-12) [33] as a measure of mental health, and a Visual Analogue Scale (VAS) as a measure of

satisfaction with different life areas. The electronic versions used for WHO-5 and GHQ-12 have been considered equivalent to the paper-and-pencil version [34].

Subsequently, patients had to connect to the EMA interface once a day (at the end of the day). No reminder (e.g. e-mail, sms or pop-ups) was made in this first step of MeMind development. In this "diary EMA" patients answered the WHO-5 and the five VAS questions regarding satisfaction with oneself, family, friends, studies and leisure, during the day. Additionally, they had a free-text area ("notes") that they could use at any moment when engaging in their daily life activities.

Patients didn't receive any economic incentive for participation and circumstances and setting of the study were very similar to real world conditions.

Statistical Analysis

For analysis purposes, subjects were divided into two groups: users (patients who accessed the "diary EMA" at least once) and non-active users (patients who never accessed the "diary EMA").

According to Barrigón et al.[26] the group was divided based on just one access to the diary EMA since one of our first purposes was to identify the patients that showed initial interest to EMA and were more prone to use the tool. Although considering these criteria we cannot strictly speak of "adherence", the adherent group would be considered the users group and the non-adherent group would be considered the non-active users group. The type of adherence (bigger, smaller, partial) was not assessed in this preliminary study.

Univariate analyses using chi-square and t-test were performed to compare characteristics between the two groups. The variables analyzed were: sociodemographic (age, sex, ethnicity, academic performance, separation of parents or divorce) and clinical (diagnosis, self-harm behavior, substance use, stressful life events, illness severity, general mental health index, subjective psychological well-being, and satisfaction with different life areas).

Subsequently, a regression analysis was carried out to establish the magnitude of the association between characteristics of patients that were different between groups and the use of EMA.

Results

There were 209 patients that accepted participation in the study. From them, 83 (39.7%) accessed the diary EMA interface (users), while 126 (60.3%) did not access the diary EMA (non-active users). Information regarding EMA users access is in Table 1.

Table 1

Users Access to EMA

	M	SD	Minimum	Maximum
Number of entries	10.52	16	1	111
Total tracking time	42.4	53.9	0	239
Tracking frequency	5	9.6	0	81

Note. Number of entries (number of times a patient enters EMA). Total tracking time (days from the EMA activation until the last entry). Tracking frequency (patients make an entry every "X" days).

Univariate Analysis

Sociodemographic Characteristics of the Sample.

Participants were (53.6%) women and (46.4%) men, with a mean age of 15 years old (SD=1.7). Most subjects were Spanish (81.8%) and lived with both parents (73.2%). 46.3 % of participants had repeated a grade at least once. There were no differences between users and non-active users in these sociodemographic characteristics (Table 2).

Clinical Characteristics of the Sample.

Table 3 summarizes the clinical characteristics of the total sample and compares users and non-active users.

Most patients were diagnosed with hyperkinetic disorders (F90 ICD-10) (61.6%). There were more patients diagnosed with this diagnosis in the group of non-active users (68.9%) than in the group of users (51.4%) ($\chi 2 = 5.626$, $p = .018$). Anxiety related disorders (F4 ICD-10) (22.6%) and affective disorders (F3 ICD-10) (22 %) were also frequent. There were more patients diagnosed with anxiety related disorders in the group of users (27%) than in the group of non-active users (19.4%), however this difference was not statistically significant. According to affective disorders, the percentage of patients in each group was very similar, finding no statistically significant differences between groups.

Regarding self-harm behavior, there were differences between groups in some specific areas. Users were more likely to report NSSI across lifetime (24.1% of active users) ($\chi 2 = 9.353$, $p = .002$) and suicidal attempts were also more frequent in the group of users (up to 16.9 % of users reported lifetime suicidal attempts) ($\chi 2 = 3.927$, $p = 0.048$). Although lifetime suicidal ideation and suicidal planification were more common in the group of users, these differences were not statistically significant.

Concerning other clinical measures such as substance use, stressful life events, illness severity, general mental health index, subjective psychological well-being and satisfaction with different life areas differences were not found.

Table 2

Sociodemographic Characteristics of the Sample

Sociodemographic characteristics	Total N= 209	Users N=83	Non-active users N=126	t / x^2	df	p value
Sex (% females)	53.6% (112)	60.2% (50)	49.2% (62)	2.450	1	.118
Age (M ± SD)	15.2 (± 1.7)	15.1 (± 1.8)	15.4 (± 1.6)	-1.296	207	.196
Country of origin (% Spanish)	81.8 % (171)	81.9 % (68)	81.7 % (103)	0.001	1	.973
Living with (% both parents)	73.2 % (153)	68. 7 % (57)	76. 2 % (96)	1.441	1	.230
Repeated a grade (% repeated at least once)	46.3 % (93/201)	43.2 % (35/201)	48.3 % (58/201)	0.511	1	.475

Note. p values significant at the **p* < .05 level (bilateral)

Table 3

Clinical Characteristics of the Sample

Clinical characteristics	Total N= 209	Users N=83	Non-active users N=126	t / x^2	df	p value
Hyperkinetic disorders	61.6% (109)	51.4% (38)	68.9% (71)	5.626	1	.018*
Anxiety disorders	22.6% (40)	27% (20)	19.4% (20)	1.426	1	.232
Affective disorders	22 % (39)	23 % (17)	21.4 % (22)	0.065	1	.798
Lifetime NSSI	14.8 % (31)	24.1 % (20)	8. 7 % (11)	9.353	1	.002**
Lifetime suicidal ideation	5.7 % (12)	8.4 % (7)	4% (5)	1.844	1	.175

Lifetime suicidal planification	3.3 % (7)	6 % (5)	1.6 % (2)	3.043	1	.081
Lifetime suicidal attempt	11.5 % (24)	16.9 % (14)	7.9 % (10)	3.927	1	.048*
Substance use	6.7 % (14)	6.3 % (8)	7.2 % (6)	0.062	1	.803
Bullying	24.4 % (51)	27.7 % (23)	22. 2 % (28)	0.817	1	.366
Sexual abuse	2. 9 % (6)	3. 6 % (3)	2. 4 % (3)	0.273	1	.601
Physical abuse	3.3 % (7)	3. 2 % (4)	3. 6 % (3)	0.030	1	.863
CGI (M ± SD)	3.46 (0.8)	3.57 (0.7)	3.40 (0.82)	-1.497	190	.136
CGAS (M ± SD)	7.5 (1.1)	7.42 (1.1)	7.49 (1.1)	0.425	189	.671

WHO-5 (M ± SD)	220.9 (68.9)	238.3 (87.4)	203. 5 (45.6)	-0.866	10	.407
GHQ-12 (M ± SD)	2.7 (3.2)	2.4 (3.1)	2.8 (3.3)	0.729	160	.467
VAS oneself (M ± SD)	67.84 (25.09)	69.22 (24.61)	69.22 (24.61)	0.827	175	.409
VAS family (M ± SD)	72.22 (26.19)	70.63 (27.05)	73.48 (25.54)	0.721	177	.472
VAS friends (M ± SD)	77.60 (23.13)	76.71 (24.45)	78. 30 (22.10)	0.456	177	.649
VAS studies (M ± SD)	54.06 (26.88)	53.81 (28.03)	54. 25 (26.08)	0.109	175	.913
VAS leisure (M ± SD)	71.10 (29.45)	68.59 (30.47)	73.09 (28.62)	1.012	176	.313

Note. **p* < .05, ***p* < .01. CGI=Clinical Global Impression scale. Scores range from 1 (*not ill*) to 7 (*extremely ill*). CGAS= Children's Global Assessment Scale. Scores range from 1 (constant need for supervision) to 10 (optimal functioning). WHO-5= World Health Organization Well-Being Index. Scores range from 0 (*lower well-being*) to 500 (*greater well-being*). GHQ-12 = General Health Questionnaire.

Scores range from 0 (*absence of psychological disturbance*) to 12 (*severe psychological disturbance*).

VAS= Visual Analogue Scale. Scores range from 0 (*lower satisfaction*) to 100 (*greater satisfaction*).

Regression Model

We performed binary logistic regression analyses with all the significant variables as predictors of the EMA user profile. The variables that remained in the model were: "NSSI across lifetime" and "hyperkinetic disorders". These results suggest a statistically significant relationship between these variables and being an EMA user profile. Patients with "NSSI across lifetime" were more prone to be active users, while patients diagnosed with "hyperkinetic disorders" were more prone to be non-active users. "Lifetime suicidal attempts" was removed from the model in the regression analysis (Table 4).

Table 4

Summary of Logistic Regression Analyses for Variables Predicting Use of EMA

Step	Predictor	B	SE B	OR (95% CI)
1	Lifetime NSSI	1.06*	0.49	2.89 (1.11-7.51)
	Hiperkinetic disorders	- 0.66*	0.32	0.52 (0.27-0.98)
	Lifetime suicidal attempts	0.143	0.57	1.15 (0.38-3.52)
	Constant	- 0.09	0.27	0.91
2	Lifetime NSSI	1.09*	0.47	2.99 (1.19-7.52)
	Hiperkinetic disorders	- 0.67*	0.32	0.51(0.27-0.96)
	Constant	- 0.76	0.26	0.93

Note. *p < .05. OR= Odds Ratio

Discussion

In our study, 39.7% of the samples were considered users. This figure is above that found in the similar study carried out in adult clinical population (20.5%) [26]. The difference between figures is in line with studies showing a better acceptance of internet-based interventions among younger people [26,35].

Our findings indicate that NSSI and suicidal attempts were significantly more common in the group of users, while hyperkinetic disorders were more common in the group of non-active users. Univariate analyses confirmed this relationship; however, the logistic regression analysis did not confirm it in the case of suicidal attempts, that didn't predict EMA use by its own.

According to our hypothesis we found that the patients diagnosed with hyperkinetic disorders were less prone to use EMA. However, a recent systematic review concerning the use of EMA in ADHD concluded that EMA could be successfully implemented with patients diagnosed with ADHD [36]. The majority of the studies were carried out in samples of children up to 12 years old and/or their parents, and they indicate that parent involvement may be critical to maintaining child adherence rates. Only one study was conducted in an adolescent sample [37]. In this four-day study the decliners of the study received more deviant parent ADHD ratings than did the participants, although the final adherence of the non-decliner group was high (80%). The use of EMA in adolescent population diagnosed with "hyperkinetic disorders" seems more complex but not useless. Appropriate adaptations such as parent involvement [36, 38], shorter periods of assessment [37], the use of implicit models of EMA [39], or more general facilitators such as training of

participants and compliance monitoring/check-ins combined with compliance-based incentives [40] might improve the usage in this population.

A positive relationship between self-harm behaviors and the use of EMA was found, which is connected to previous reports. Barrigón et al. [26] found that patients with suicidal thoughts and plans were more likely to be EMA active users in adult population. In our study we found that different self-harm behaviors (NSSI, suicidal ideation, suicidal planification and suicidal attempt) were more common in the group of users, although only NSSI predicted being a user. Fortunately our sample size of adolescents with lifetime suicidal ideation (5.7%) and lifetime suicidal planification (3.3%) was small. On the other hand, NSSI in adolescence is a common behavior, indicating prevalence around 21.7 % in outpatient clinical samples [14] (15% in our sample). The relationship between NSSI and suicide is not clear but it has been hypothesized that NSSI is a gateway facilitating adolescents to attempt suicide [41]. Both behaviors frequently coexist [42] and NSSI seems to be an important risk factor for suicide after adjusting for other risk factors [43]. All this might be in relation to the fact that only these two self-harm behaviors (lifetime NSSI and lifetime suicidal attempts) were related to the use of EMA in our study, however we can't draw conclusions regarding this issue, since the frequency of self-harm behaviors was low and it goes beyond the scope of this work. It is also curious that there were more lifetime suicide attempters (11.5%) than lifetime suicide ideators or planificators in our sample. Impulsivity is a core characteristic of adolescence, which might explain the impulsive nature of suicidal attempts during this period. Moreover, information regarding suicidal ideation or planification is easier to omit (less evident) than past suicidal attempts.

There are different factors that might be related to the association between self-harm behavior and EMA use. As it was mentioned before [15] self-harming youth make more use of new technologies in order to communicate to others. Additionally, Rickwood et al. [27] found that a higher percentage of young web-based support users presented high or very high levels of psychological distress but they were at an earlier stage of illness. Adolescents with NSSI are supposed to suffer from high levels of psychological distress and they might be -according to the aforementioned theories regarding NSSI as a gateway to suicide [41]- in an "early" stage of illness. Alternative explanations might be related to the fact that caregiver involvement and monitoring could be higher in patients that have a history of self-harm behavior.

This preliminary study adds novel and promising information about EMA use in clinical practice. In our sample, adolescents with self-harm behaviors were more active in the use of EMA tool than other adolescents, which provide support for the use of EMA in this population.

A recent paper concerning the current challenges in research on suicide advocates the use of EMA [44]. It might be very useful since accurate monitoring of NSSI with EMA could help with identifying the events recorded in the NSSI population that could predict NSSI and/or suicidal attempts during follow-up.

Our study has some limitations. Given that the use of the tool "MEmind" in the clinical setting is relatively time consuming for clinicians, optimal data collection was at times complicated. The sample size was small and diagnosis variability was limited also. We should acknowledge that certain behaviors had a low frequency – such us some self-harm

behaviors –; hence we must be cautious when drawing conclusions and take these results as provisional.

The fact that we used a naturalistic clinical adolescent sample also limits the generalization of our results, however this makes the results ecological and adapted to the real clinical setting. In relation to the EMA interface for adolescents it still has some limitations such as lack of pop-ups or reminders, which make adherence more complicated. The fact that patients didn't have any direct incentive for completing EMA also makes adherence more complicated.

Conclusions

Nevertheless, to the best of our knowledge, this is the first study that specifically examines the personal variables that are in relation to EMA use in adolescents assisted in outpatient mental health services. This study has important research and clinical implications since it provides clues as to the application of EMA in varying clinical subpopulations.

Future studies might consider the inclusion of bigger samples and the examination of potential differences between high frequency and low frequency users, as well as EMA tool improvements.

References

1. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. Annu Rev Clin Psychol. 2008;4:1–32.

2. Reis HT, Gable SL. Event-sampling and other methods for studying everyday experience. In: Handbook of research methods in social and personality psychology. New York, NY, US: Cambridge University Press; 2000. p. 190–222.

3. Hektner J, Schmidt J, Csikszentmihalyi M. Experience Sampling Method: Measuring the Quality of Everyday Life. Thousand Oaks, CA: SAGE Publications; 2006.

4. Hufford MR, Shields AL, Shiffman S, Paty J, Balabanis M. Reactivity to ecological momentary assessment: an example using undergraduate problem drinkers. Psychol Addict Behav. 2002 Sep;16(3):205–11.

5. Stone AA, Shiffman S, Schwartz JE, Broderick JE, Hufford MR. Patient compliance with paper and electronic diaries. Control Clin Trials. 2003 Apr;24(2):182–99.

6. Shiffman S. Designing protocols for ecological momentary assessment. In: Stone AA, Shiffman S, Atienza A & Nebeling A, editors. *The science of real-time data capture: Self-reports in health research,* New York: Oxford University Press; 2007, p. 27–53.

7. Finkelstein J, Cabrera MR, Hripcsak G. Internet-based home asthma telemonitoring: can patients handle the technology? Chest. 2000 Jan;117(1):148–55.

8. Myin-Germeys I, Birchwood M, Kwapil T. From environment to therapy in psychosis: a real-world momentary assessment approach. Schizophr Bull. 2011 Mar;37(2):244–7.

9. Swendsen J, Ben-Zeev D, Granholm E. Real-time electronic ambulatory monitoring of substance use and symptom expression in schizophrenia. Am J Psychiatry. 2011 Feb;168(2):202–9.

10. Peeters F, Berkhof J, Delespaul P, Rottenberg J, Nicolson NA. Diurnal mood variation in major depressive disorder. Emotion. 2006 Aug;6(3):383–91.

11. Putnam KM, McSweeney LB. Depressive symptoms and baseline prefrontal EEG alpha activity: a study utilizing Ecological Momentary Assessment. Biol Psychol. 2008 Feb;77(2):237–40.

12. Shiffman S. Conceptualizing Analyses of Ecological Momentary Assessment Data. Nicotine & Tobacco Research. 2014 May 1;16(Suppl 2):S76–87.

13. Rodríguez-Blanco L, Carballo JJ, Baca-García E. Use of Ecological Momentary Assessment (EMA) in Non-Suicidal Self-Injury (NSSI): A systematic review. Psychiatry Res. 2018;263:212–9.

14. Díaz de Neira M,García-Nieto R,de León-Martinez V,Pérez Fominaya M,Baca-García E,Carballo JJ. Prevalencia y funciones de los pensamientos y conductas autoagresivas en una muestra de adolescentes evaluados en consultas externas de salud mental. Rev Psiquiatr Salud Ment. 2015;8:137-145.

15. Memon AM, Sharma SG, Mohite SS, Jain S. The role of online social networking on deliberate self-harm and suicidality in adolescents: A systematized review of literature. Indian J Psychiatry. 2018;60(4):384–92.

16. Wen CKF, Schneider S, Stone AA, Spruijt-Metz D. Compliance With Mobile Ecological Momentary Assessment Protocols in Children and Adolescents: A Systematic Review and Meta-Analysis. J Med Internet Res. 2017 Apr 26;19(4):e132.

17. Cain AE, Depp CA, Jeste DV. Ecological Momentary Assessment in Aging Research: A Critical Review. J Psychiatr Res. 2009 Jul;43(11):987–96.

18. Morren M, van Dulmen S, Ouwerkerk J, Bensing J. Compliance with momentary pain measurement using electronic diaries: a systematic review. Eur J Pain. 2009 Apr;13(4):354–65.

19. Borus JS, Blood E, Volkening LK, Laffel L, Shrier LA. Momentary assessment of social context and glucose monitoring adherence in adolescents with type 1 diabetes. J Adolesc Health. 2013 May;52(5):578–83.

20. Connelly M, Bromberg MH, Anthony KK, Gil KM, Franks L, Schanberg LE. Emotion regulation predicts pain and functioning in children with juvenile idiopathic arthritis: an electronic diary study. J Pediatr Psychol. 2012 Feb;37(1):43–52.

21. Connelly M, Miller T, Gerry G, Bickel J. Electronic momentary assessment of weather changes as a trigger of headaches in children. Headache. 2010 May;50(5):779–89.

22. Dunton G, Dzubur E, Li M, Huh J, Intille S, McConnell R. Momentary Assessment of Psychosocial Stressors, Context, and Asthma Symptoms in Hispanic Adolescents. Behav Modif. 2016 Jan;40(1–2):257–80.

23. Khor AS, Gray KM, Reid SC, Melvin GA. Feasibility and validity of ecological momentary assessment in adolescents with high-functioning autism and Asperger's disorder. J Adolesc. 2014 Jan;37(1):37– 46.

24. Bromberg MH, Connelly M, Anthony KK, Gil KM, Schanberg LE. Self-reported pain and disease symptoms persist in juvenile idiopathic arthritis despite treatment advances: an electronic diary study. Arthritis & Rheumatology. 2014 Feb;66(2):462–9.

25. Stinson JN, Jibb LA, Nguyen C, Nathan PC, Maloney AM, Dupuis LL, et al. Development and testing of a multidimensional iPhone pain assessment

application for adolescents with cancer. J Med Internet Res. 2013 Mar 8;15(3):e51.

26. Barrigón ML, Berrouiguet S, Carballo JJ, Bonal-Giménez C, Fernández-Navarro P, Pfang B, et al. User profiles of an electronic mental health tool for ecological momentary assessment: MEmind. Int J Methods Psychiatr Res. 2017;26(1).

27. Rickwood D, Webb M, Kennedy V, Telford N. Who Are the Young People Choosing Web-based Mental Health Support? Findings From the Implementation of Australia's National Web-based Youth Mental Health Service, eheadspace. JMIR Mental Health. 2016;3(3):e40.

28. Rosen PJ, Epstein JN, Van Orden G. I know it when I quantify it: ecological momentary assessment and recurrence quantification analysis of emotion dysregulation in children with ADHD. Atten Defic Hyperact Disord. 2013 Sep;5(3):283–94.

29. World Health Organization (WHO). Tenth Revision of the International Classification of Diseases and Related Health Problems (ICD-10). Geneva: WHO; 1992.

30. Guy W. ECDEU Assessment Manual for Psychopharmacology. Rockville, MD: US Department of Heath, Education, and Welfare Public Health Service Alcohol, Drug Abuse, and Mental Health Administration, 1976.

31. Shaffer D, Gould MS, Brasic J, Ambrosini P, Fisher P, Bird H, et al. A children's global assessment scale (CGAS). Arch Gen Psychiatry. 1983 Nov;40(11):1228–31.

32. World Health Organization. The WHO-5 website https://www.psykiatri-regionh.dk/who-5/Documents/WHO5_English.pdf [Retrieved August 29, 2015].

33. Sánchez-López M del P, Dresch V. The 12-Item General Health Questionnaire (GHQ-12): reliability, external validity and factor structure in the Spanish population. Psicothema. 2008 Nov;20(4):839–43.

34. Barrigón ML, et al. Estudio comparativo de los formatos en lápiz y papel y electrónicos de los cuestionarios GHQ-12, WHO-5 y PHQ-9. Rev Psiquiatr Salud Ment. 2017.

35. Lal S, Adair CE. E-Mental Health: A Rapid Review of the Literature. Psychiatric Services. 2014 Jan;65(1):24–32.

36. Miguelez-Fernandez C, de Leon SJ, Baltasar-Tello I, Peñuelas-Calvo I, Barrigon ML, Capdevila AS, et al. Evaluating attention-deficit/hyperactivity disorder using ecological momentary assessment: a systematic review. Atten Defic Hyperact Disord. 2018 Dec;10(4):247–65.

37. Whalen CK, Jamner LD, Henker B, Delfino RJ, Lozano JM. The ADHD Spectrum and Everyday Life: Experience Sampling of Adolescent Moods, Activities, Smoking, and Drinking. Child Development. 2002;73(1):209–27.

38. O'Connor SG, Koprowski C, Dzubur E, Leventhal AM, Huh J, Dunton GF. Differences in Mothers' and Children's Dietary Intake during Physical and Sedentary Activities: An Ecological Momentary Assessment Study. J Acad Nutr Diet. 2017 Aug;117(8):1265–71.

39. Berrouiguet S, Ramírez D, Barrigón ML, Moreno-Muñoz P, Carmona Camacho R, Baca-García E, et al. Combining Continuous Smartphone Native Sensors Data Capture and Unsupervised Data Mining Techniques for Behavioral Changes Detection: A Case Series of the Evidence-Based Behavior (eB2) Study. JMIR Mhealth Uhealth. 2018 Dec 10;6(12):e197.

40. Heron KE, Everhart RS, McHale SM, Smyth JM. Using Mobile-Technology-Based Ecological Momentary Assessment (EMA) Methods With Youth: A Systematic Review and Recommendations. J Pediatr Psychol. 2017 01;42(10):1087–107.

41. Grandclerc S, Labrouhe DD, Spodenkiewicz M, Lachal J, Moro M-R. Relations between Nonsuicidal Self-Injury and Suicidal Behavior in Adolescence: A Systematic Review. PLOS ONE. 2016 abr;11(4):e0153760.

42. Nock MK, Joiner TE, Gordon KH, Lloyd-Richardson E, Prinstein MJ. Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. Psychiatry Research. 2006 Sep 30;144(1):65–72.

43. Andover MS, Gibb BE. Non-suicidal self-injury, attempted suicide, and suicidal intent among psychiatric inpatients. Psychiatry Research. 2010 Jun 30;178(1):101–5.

44. Barrigón ML, Baca-García E. Current challenges in research in suicide. Rev Psiquiatr Salud Ment. 2018 Mar;11(1):1–3.

6.2. MATERIAL SUPLEMENTARIO

6.2.1. Material suplementario artículo 1

Tabla S1

Differences between NSSI patients who continued and abandoned treatment

	Total N= 44	Maintain treatment after 18 years old N=29	Leave treatment before18 years old N=15	t / x^2	df	*p* value
Sex (% males)	59.1% (26)	55.2 % (16)	66.7% (10)	0.540	1	0.53
Age of first NSSI episode	11.36 (± 3.6)	11.73 (± 3.5)	10.68 (± 3.7)	-0.836	42	0.41
Lifetime suicidal ideation	47.7% (21)	48.3% (14)	46.7% (7)	0.010	1	1.00
Lifetime suicidal planification	6.8 % (3)	6.9 % (2)	6.7 % (1)	0.533	2	0.77
Lifetime suicidal gesture	18.2 % (8)	13.8 % (4)	26.7 % (5)	1.458	2	0.48

Lifetime suicidal attempt	13.6 % (6)	10.3 % (3)	20 % (3)	0.783	1	0.38
Family Apgar	6.53 (± 2.2)	6.89 (± 2.3)	5.64 (± 1.8)	-1.615	36	0.12
CDI	13.58 (± 9)	14.50 (± 8.6)	11.87 (± 9.8)	-0.876	26	0.39
SDQ-A Emotional	4.53 (± 2.9)	4.59 (± 2.9)	4.36(± 3.1)	-0.217	36	0.83
SDQ-A Conduct	3.11 (± 2)	2.67 (± 1.8)	4.18 (± 2.4)	2.121	36	0.04*
SDQ-A Hyperactivity	5.51 (± 2.9)	5.41 (± 2.2)	5.55 (± 2.9)	0.156	36	0.87
SDQ-A Peers	2.22 (± 2)	2.00 (± 2)	2.73 (± 1.9)	1.018	35	0.32
SDQ-A Prosocial	8.08 (± 1.7)	8.36 (± 1.2)	7.45 (± 2.6)	-1.115	12	0.29

SDQ-A Total	13.32 (± 6.2)	14.69 (± 15.8)	16.82 (± 7.1)	0.948	35	0.35
SDQ-P Emotional	5.32 (± 2.8)	5.44 (± 3.2)	5.08 (± 1.6)	-0.453	35	0.65
SDQ-P Conduct	4.22 (± 2.2)	3.92 (± 1.8)	4.83 (± 2.9)	1.006	15	0.33
SDQ-P Hyperactivity	5.51 (± 2.9)	5.16 (± 3.1)	6.25 (± 2.4)	1.068	35	0.29
SDQ-P Peers	2.43 (± 1.9)	2.08 (± 1.8)	3.17 (± 2.0)	1.634	35	0.11
SDQ-P Prosocial	7.19 (± 1.9)	7.64 (± 1.8)	6.25 (± 2.1)	-2.086	35	0.04*
SDQ-A Total	17.49 (± 6.9)	16.60 (± 7.3)	19.33 (± 5.8)	1.138	35	0.26

Note. *p < .05

Tabla S2

Differences between non-NSSI patients who continued and abandoned treatment

	Total N= 103	Maintain treatment after 18 years old N= 67	Leave treatment before18 years old N= 36	t / x^2	df	*p* value
Sex (% males)	62.1% (64)	61.2% (41)	63.9% (23)	0.072	1	0.83
Age	15.35 (± 1.2)	15.39 (± 1.3)	15.28 (± 1.1)	-0.436	101	0.66
Lifetime suicidal ideation	16.5% (17)	17.9% (12)	13.9% (5)	0.275	1	0.78
Lifetime suicidal planification	2.9 % (3)	4.5 % (3)	0 % (0)	1.836	2	0.40
Lifetime suicidal gesture	8.7 % (9)	10.4 % (7)	5.6 % (2)	0.932	2	0.63

Lifetime suicidal attempt	3.9 % (4)	6.1 % (4)	0 % (0)	2.271	1	0.13
Family Apgar	7.63 (± 2.1)	7.80 (± 1.8)	7.29 (± 2.6)	-1.028	51	0.31
CDI	10.47 (± 6.6)	10.49 (± 6.5)	10.42 (± 6.8)	-0.055	101	0.96
SDQ-A Emotional	2.72 (± 2.4)	2.71 (± 2.3)	2.74 (± 2.8)	0.049	94	0.96
SDQ-A Conduct	2.32 (± 1.8)	2.35 (± 1.9)	2.26 (± 1.6)	-0.234	94	0.82
SDQ-A Hyperactivity	4.77 (± 2.2)	4.79 (± 2.3)	4.73 (± 2.2)	-0.131	93	0.90
SDQ-A Peers	1.66 (± 1.9)	1.71 (± 1.8)	1.58 (± 2.1)	-0.329	93	0.74
SDQ-A Prosocial	8.42 (± 1.5)	8.57 (± 1.5)	8.15 (± 1.5)	-1.362	93	0.18

SDQ-A Total	11.47 (± 5.5)	11.56 (± 5.7)	11.30 (± 5)	-0.220	93	0.83
SDQ-P Emotional	3.78 (± 2.5)	3.68 (± 2.3)	4.00 (± 2.9)	0.573	89	0.57
SDQ-P Conduct	3.04 (± 2.2)	2.79 (± 2.1)	3.59 (± 2.2)	1.646	89	0.11
SDQ-P Hyperactivity	5.04 (± 2.3)	5.03 (± 2.3)	5.07(± 2.2)	0.072	89	0.94
SDQ-P Peers	2.75 (± 2.2)	2.71 (± 2.2)	2.83 (± 2.0)	0.241	89	0.81
SDQ-P Prosocial	7.69 (± 2.4)	7.95 (± 2.1)	7.14 (± 2.9)	-1.344	42	0.19
SDQ-P Total	14.62 (± 5.7)	14.21 (± 5.6)	15.48 (± 5.9)	0.990	89	0.33

*Note. *p < .05*

6.2.2. Material suplementario artículo 2

Tablas resumen de los artículos revisados

Reference	Ammerman, B. A., Olino, T. M., Coccaro, E. F., McCloskey, M.S., 2017. Predicting nonsuicidal self-injury in borderline personality disorder using ecological momentary assessment. J. Pers. Disord. 10, 1-12.
Aim of the study	To study potential mechanisms -which included the daily experience of negative affect, and aggressive and impulsive urges; and distress tolerance- that may facilitate NSSI among patientes with comorbid borderline personality disorder (BPD) and depression.
Sample	51 individuals meeting current diagnostic criteria for BPD and a comorbid depressive disorder. The sample was predominantly female (n = 38, 74.5%) and ranged in age from 19 to 53 (M = 28.82, SD = 9.77).
EMA method	For 7 days, participants received four phone calls; each call occurred at a random interval within one of four 3-hr time slots and involved a brief assessment of daily self-injurious behaviours and momentary experiences. They were asked if, since the last phone call, they had engaged in self-injurious behavior, without the intent to die. They were also asked to rate their urge to hurt themselves, which was recorded dichotomously. To assess negative affect, negative affect scale of Positive and Negative Affect Scale (PANAS) was used. In addition, participants were asked two additional items where they rated their emotional experiences of feeling impulsive.
Subject's adherence	On average, participants completed phone calls on 5.5 days (78%).
Outcomes	The number of NSSI acts per day ranged from 1 to 14 acts. Daily urges to hurt oneself and impulsive urges, but not daily negative affect or aggressive urges, predicted NSSI. Low levels of distress tolerance was a stronger predictor of NSSI behaviour than daily experiences.

Reference	Andrewes, H. E., Hulbert, C., Cotton, S. M., Betts, J., & Chanen, A. M. (2016). Ecological Momentary Assessment of Nonsuicidal Self-Injury in Youth With Borderline Personality Disorder. Personality Disorders: Theory, Research, and Treatment. Advance online publication
Aim of the study	This study aimed to delineate the real-time motives and changes in affect that trigger and maintain NSSI in youth with BPD and establish the temporal course of changes in affect, initial self-injurious thoughts, and engagement in NSSI
Sample	107 young people with BPD. The sample was predominantly female (83.2%) and ranged in age from 15 to 25 (M = 18.1, SD = 2.7). 22% of the sample engaged in NSSI during the EMA
EMA method	Participants completed a randomly prompted questionnaire about their affect, self-injurious thoughts, and behaviours 6 times per day for 6 days with a mobile phone. Response prompts were randomized within 2-hr time blocks between 10 a.m. and 10 p.m. Current positive and negative affect was measured by the 10-item PANAS. NSSI and self-injurious thoughts were captured by a set of items which comprised the closed questions with yes/no answer ('Since the last signal have you thought about deliberately hurting yourself?' 'Since the last signal, have you actually hurt your-self?') and open questions ('What did you do to hurt yourself?' 'What was going on, just before you thought about hurting yourself?' 'Why did you hurt yourself?'). These questions identified the occurrence of engagement in a self-injurious thought and/or NSSI, the methods used to engage in NSSI, and the context and motive for engaging in NSSI, respectively.
Subject's adherence	If participants did not complete at least one survey per day, the phone was left with them for a second week. Participants were reimbursed $40 for their participation, regardless of their adherence. 22 participants (21%) were given the phone for a second week because they completed an insufficient number of data entries in the first week. An average of 51.56% of the total available random samples were completed
Outcomes	A large minority of participants could identify neither their motives nor the environmental precipitants (46%) for NSSI. Changes in affect revealed a pattern of increasing negative and decreasing positive affect prior to NSSI, with a reduction in negative and an increase in positive affect following NSSI. Initial self-injurious thoughts and changes in negative and positive affect occurred a median of 35, 15, and 10 hr prior to NSSI, respectively.

Reference	Andrewes, H. E., Hulbert, C., Cotton, S. M., Betts, J., & Chanen, A. M. (2017). An ecological momentary assessment investigation of complex and conflicting emotions in youth with borderline personality disorder. Psychiatry Research, 252, 102–110.
Aim of the study	To examine the relationships between NSSI and the number of negative ('negative complex') and opposing valence ('conflicting') emotions in youth with BPD.
Sample	107 young people with BPD. The sample was predominantly female (83.2%) and ranged in age from 15 to 25 (M = 18.1, SD = 2.7). 22% of the sample engaged in NSSI during the EMA, 43% of the sample was engaged in self-injurious thoughts only and 35% were comparision group.
EMA method	Participants completed a randomly prompted questionnaire about their affect, self-injurious thoughts (SIT), and behaviors 6 times per day for 6 days with mobile phone. Response prompts were randomized within 2-hr time blocks between 10 a.m. and 10 p.m. Conflicting emotions were identified via ratings on the 10-item short-form of the PANAS. Negative complex emotions were defined as two or more co-occurring negative emotions. Conflicting emotions were defined as the co-occurrence of at least two emotions of opposing valence. SIT and NSSI events were also captured via a set of closed questions delivered by the program including: 'Since the last signal have you thought about deliberately hurting yourself?'; 'Since the last signal, have you actually hurt yourself?'.
Subject's adherence	If participants failed to complete at least one survey during a day, the phone was left with them for another six days. Participants were reimbursed $40 for their participation. Participants completed an average of 18.56 (SD =10) of the possible 36 diary entries (51.56% adherence).
Outcome	Changes in negative complex emotions fitted a quadratic model prior to and following NSSI, whereas this was absent for the comparison group. The pattern of negative complex emotions occurring in the 20- and 10-h before and after SIT did not follow a quadratic curve. Conflicting emotions did not mirror the changes in self-reported levels of distress and did not significantly increase prior to, and reduce following SIT or NSSI. Third, the intensity of distress reported while engaging in SIT and reported during NSSI were not significantly different

Reference	Anestis, M. D., Silva, C., Lavender, J. M., Crosby, R. D., Wonderlich, S. A., Engel, S. G., & Joiner, T. E. (2012). Predicting nonsuicidal self-injury episodes over a discrete period of time in a sample of women diagnosed with bulimia nervosa: An analysis of self-reported trait and ecological momentary assessment based affective lability and previous suicide attempts. International Journal of Eating Disorders, 45(6), 808-811.
Aim of the study	To examine the moderating effect of trait affective lability on the relationship between past suicidal behaviour and future nonsuicidal self-injury (NSSI).
Sample	127 female participants aged 18–55 (M= 25.34, S.D=7.71), all of whom met criteria for bulimia nervosa (BN).
EMA method	Participants were trained to respond to six semi-random prompts each day. Once prompted, the participants answered the same series of questions regarding their mood and behaviors between that moment and the most recent prior prompt by the palm top computer. PANAS was filled out several times per day over a period of two weeks. Only the Negative Affect subscale was utilized in these analyses and, when used, served as a predictor variable (EMA affective lability). In the context of this study, this variable represented the degree to which, on average, each participant's level of negative affect differed from the level that preceded it. In addition to the scheduled prompts, participants were instructed to also enter data immediately after they engaged in a behavior from a set of behaviors listed (Eating Disorder and Self-Destructive Behavior Checklist). Additionally, at the end of each day, participants provided data summarizing the course of the most recent day with respect to mood, stress, and behavior.
Subject's adherence	Participants were given $200 for participating in two weeks of EMA assessments. Additionally, participants who completed 85% or more of the EMA assessments were given an additional $50 in an effort to improve compliance rates
Outcomes	Interaction of self-reported trait affective lability (but no EMA affective lability) and past suicidal behavior exhibit clinical utility in the prediction of patients' imminent risk of engaging in NSSI.

Reference	Armey, M. F., Crowther, J. H., & Miller, I. W. (2011). Changes in ecological momentary assessment reported affect associated with episodes of nonsuicidal self-injury. Behavior Therapy, 42(4), 579–588.
Aim of the study	To examine changes in affect before, during, and following an NSSI event through the use of EMA.
Sample	36 college students with a self-reported history of NSSI. Participant age was consistent with the recruitment of first-year college students (M = 18.70, SD = 0.79). The sample was predominantly female (75%).
EMA method	The original 20-item PANAS as well as the PANAS-X guilt and hostility subscales were administered at each assessment point. A random schedule of assessments was generated which allowed the partitioning of daytime hours (10 a.m.–10 p.m.) into six 2-hour segments. Event-triggered assessment was identical to the random assessment, with the addition of questions that assessed NSSI behavior. Participants were prompted to identify both the form (cut/carved skin, picked wound, beat/hit self, burned self, scraped skin, or bit self) and time spent planning to engage in NSSI (none at all, a few seconds, a few minutes, less than an hour, less than 1 day, 1 to 2 days, or more than 2 days). In an effort to maximize variability of the measure, subjectively rated severity of NSSI episodes (none, not at all, a little, somewhat, very, or extremely) was chosen rather than presence/absence of an NSSI event.
Subject's adherence	Students were offered research credit. A small number of participants with no interest in research credit were compensated ($35) for their participation. Participants completed 38% of the total available random samples. The majority of participants (89%) completed at least one random sample per day.
Outcomes	Results indicated that individuals who reported NSSI behaviour over the course of the study experienced increases in negative affect prior to an episode of NSSI that peaked during the episode and faded gradually in the hours following the episode, with affect change roughly approximating a quadratic curve. These changes in affect were detected only at times in which individuals engaged in NSSI and were absent for individuals who did not report NSSI over the course of the study. Moreover, changes in negative affect associated with NSSI were, on average, detectable hours prior to the NSSI event (M=7.82 hr; S.D=8.32)

Reference	Armey, M. F., Nugent, N. R., & Crowther, J. H. (2012). An exploratory analysis of situational affect, early life stress, and non-suicidal self-injury in college students. Journal of Child and Adolescent Trauma, 5, 327-343
Aim of the study	To examine the impact of trauma type and timing on both reported NSSI as traditionally measured and in vivo NSSI assessments, and characterize the process whereby distal life experiences (e.g., early traumatic experiences) may interact with characteristic emotional regulation difficulties and/or situational aversive affect to catalyze NSSI.
Sample	36 individuals (75% female) with a self-reported history of NSSI. Participant age was consistent with the recruitment of first-year college students (M = 18.70, SD = 0.79).
EMA method	Participants completed assessments using a handheld computer.A random schedule of assessments was generated which allowed the partitioning of daytime hours (10 a.m.–10 p.m.) into six two-hour segments. The random sampling questionnaire included the Experienced Emotion Regulation (EER) measure. Participants were asked to rate, on a 5-point, Likert-type scale how well the following items describe their experience of their own emotions: 'I am having difficulty making sense out of my feelings', 'I'm experiencing my emotions as overwhelming and out of my control', 'I am confused about how I feel', and 'My emotions make me uncomfortable'. These items were summed to generate a measure of experienced emotion regulation. There was also an event-sampling questionnaire that participants should complete after a NSSI event, that was comprised of items measuring affect and cognitions, including the PANAS. Participants then completed a brief assessment of the NSSI that triggered the event sampling procedure. Participants were prompted to identify the NSSI form (cut/carved skin, picked wound, beat/hit self , burned self , scraped skin, or bit self) and severity (not at all, a little, somewhat, very, or extremely).
Subject's adherence	Participants either received course credit or were paid a small fee for their participation.
Outcomes	Findings supported an interaction between negative affect (NA) measures in vivo, and cumulative trauma, such that individuals with high levels of cumulative life trauma evidenced greater in vivo NSSI severity following both high and low levels of in vivo NA.

Reference	Bentley, K. H., Nock, M. K., Sauer-Zavala, S., Gorman, B. S., & Barlow, D. H. (2017). A functional analysis of two transdiagnostic, emotion-focused interventions on nonsuicidal self-injury. Journal of Consulting and Clinical Psychology, 85(6), 632–646.
Aim of the study	To examine the specific effects of mindful emotion awareness training and cognitive reappraisal, two transdiagnostic treatment strategies that purportedly address the functional processes thought to maintain self-injurious behavior, on NSSI urges and acts.
Sample	10 diagnostically heterogeneous self-injuring adults, that meet criteria for NSSI disorder (DSM-V). 9 females and one male aged 18-30, (M= 21.3).
EMA method	Ecological momentary assessment was used to provide daily ratings of NSSI urges and acts during all study phases. Participants completed all self-report assessments on their smartphones using technology developed for real-time data collection. Participants received daily and weekly text message reminders to complete the assessments. A structured series of questions was administered in which participants were first asked whether they had experienced an urge to engage in NSSI since their last entry. If they reported an urge, they were asked follow-up questions about the urge (e.g., duration, method considered), and whether they engaged in the behavior. If they reported a NSSI behavior, they were asked follow-up questions about the behavior (e.g., method). Participants were instructed to complete this assessment at least once per day and to self-initiate an entry whenever they experienced a NSSI urge or act.
Subject's adherence	At the end of the study, participants received monetary compensation up to $300 based on number of phases completed plus a bonus for 80% compliance with assessments. Participants provided EMA data on 94.1% of days in the study, resulting in 5.9% missing daily NSSI data overall. Across participants, the greatest amount of missing daily data occurred during the baseline phase (10.5%) and the least during follow-up (5.3%). Between participants, missing daily data ranged from 0.0% to 15.7%.
Outcomes	Eight of 10 participants demonstrated clinically meaningful reductions in NSSI; 6 participants responded to 1 intervention alone, whereas 2 participants responded after the addition of the alternative intervention. Group analyses indicated statistically significant overall effects of study phase on NSSI, with fewer NSSI urges and acts occurring after the interventions were introduced. The interventions were also associated with moderate to large reductions in self-reported levels of anxiety and depression, and large improvements in mindful emotion awareness and cognitive reappraisal skills

Reference	Bresin, K., Carter, D. L., & Gordon, K. H. (2013). The relationship between trait impulsivity, negative affective states, and urge for nonsuicidal self-injury: A daily diary study. Psychiatry Research, 205, 227–231.
Aim of the study	To study the interaction between trait negative urgency and daily Negative Affect (NA), (both general and specific) in the prediction of urge to engage in NSSI.
Sample	67 participants (38 female). Age: M=19.58, S.D= 2.94. Participants indicated that they had engaged in NSSI in the past 12 months.
EMA method	Daily affect was assessed using subscales of the PANAS-X assessing guilt, sadness and distress. Urge to engage in NSSI was assessed using a single item that participants rated how strong their urge was to harm themselves without wanting to die on that day using a 5-point Likert scale. Whether or not participants had engaged in NSSI that day was also measured. The daily assessment consisted of a total of 14 days of ratings that began the Monday after the impulsivity assessment. Participants received an email at approximately 7 p.m. each evening which allowed them to access the daily survey on a secure website. Participants had until 9 a.m. the following morning to complete the questions.
Subject's adherence	Participants were given course credit for compensation. To encourage compliance, participants were given additional credit for completing at least 11 days. Participants completed an average of 11.06 days. Six participants did not complete ratings.
Outcomes	Negative urgency (impulsivity), daily sadness, but not guilt or general negative affect, was a positive predictor of urge to engage in NSSI. Meanwhile, for those low in negative urgency, sadness was unrelated to NSSI urge.

Reference	Bresin, K. (2014). Five indices of emotion regulation in participants with a history of nonsuicidal self-injury: A daily diary study. Behavior Therapy, 45, 56–66.
Aim of the study	To examine the emotional correlates (mean levels, reactivity and emotional differentiation) of NSSI.
Sample	College undergraduates with at least one NSSI incident that occurred in the last year and college undergraduates who reported no history of NSSI. The non-NSSI group consisted of 57 participants (33 women) with a mean age of 19.73 (SD = 2.94) years. The NSSI group consisted of 61 participants (34 women) with a mean age of 19.67 (SD = 3.03) years.
EMA method	Each evening, participants were sent an email at approximately 7 P.M. with a link and password for that day's diary entry using a secure website. Participants were instructed to fill out the diary as close to the time that they went to bed as possible but were given until 9 a.m the next morning to complete the questions. Affect was measured using the PANAS. Participants rated a total of 20 items, 10 related to NA (e.g., 'distressed') and 10 related to PA (e.g., 'proud'). Each day, participants reported whether nine unpleasant events and/or four pleasant events had happened to them that day. These events were taken from the Daily Events Survey. The events were summed within days to create unpleasant and pleasant event scores.
Subject's adherence	To encourage compliance, participants were given additional course credit for completing at least 11 days. Across groups, participants completed an average of 10.51 (SD = 2.97) days.
Outcomes	Compared to controls, individuals who engaged in NSSI had higher mean levels, within-person variation, and lower emotional differentiation of NA, but groups did not differ on inertia of NA or reactivity of NA. Moreover, individuals with a history of NSSI reported lower levels of positive affect and lower inertia of positive affect.

Reference	Horowitz, S., & Stermac, L. (2017). The relationship between interpersonal trauma history and the functions of non-suicidal self-injury in young adults: An experience sampling study. Journal of Trauma & Dissociation: The Official Journal of the International Society for the Study of Dissociation (ISSD), 1–15.
Aim of the study	To explore possible relationships between common NSSI functions and past interpersonal trauma.
Sample	38 self-injuring community young adults (minimum five lifetime NSSI acts, minimum two NSSI urges during the previous month. Non psychotic or personality disorder diagnosed or history of suicide attemptor psychiatric inpatient treatment) between ages 18 and 30 (M = 21.89; SD = 2.64). The majority of participants were female (n = 34), and one participant declined to report a gender.
EMA method	The daily protocol comprised a brief online survey at approximately the same time daily for 21 days reporting NSSI urges or acts occurring in the previous 24 hours. If NSSI acts were reported participants recorded the number of acts and the method(s). If participants reported either acts or urges, they completed the measure of NSSI functions
Subject's adherence	Nearly 70% (n = 27) of participants completed all 21 surveys (M = 0.50 missed surveys; SD = 0.86; range = 0-3).
Outcomes	Participants with higher trauma severity tended to endorse more NSSI functions, but also endorsed specific NSSI functions that were less relevant to individuals with lower trauma severity (interpersonal boundaries function and anti-dissociation functions.

Reference	Houben, M., Claes, L., Vansteelandt, K., Berens, A., Sleuwaegen, E., & Kuppens, P. (2017). The emotion regulation function of nonsuicidal self-injury: A momentary assessment study in inpatients with borderline personality disorder features. Journal of Abnormal Psychology, 126(1), 89–95.
Aim of the study	To investigate the emotion regulation function of NSSI in a more ecologically valid way, examining the temporal relationship between NSSI behavior and emotional experiences throughout the day in BPD inpatients.
Sample	34 inpatients with BPD (87% female) with a mean age of 29.03 (SD= 1.60).
EMA method	Participants carried a palmtop with them for 8 days in the hospital, and were prompted 10 times a day (generally between 8.30 a.m. and 9.30 p.m.; this period was divided into 10 equal intervals - mean time interval of 1.33 hours- and a questionnaire was programmed randomly within each interval). At each measurement occasion participants rated to what degree they were currently experiencing each of six different emotions (anger, depressed, anxiety, stressed, happy, relaxed) using a slider scale ranging from 0 (not at all) to 100 (very much). Negative and positive emotion ratings were averaged to form average negative emotion (NE) and average positive emotion (PE), respectively. Additionally, participants were asked to indicate whether or not they engaged in NSSI (yes/no) since the last beep.
Subject's adherence	Patients did not receive payment to ensure voluntary participation. Four participants were excluded based on poor compliance with the experience sampling protocol (25% compliance in terms of responded beeps). Average compliance rate was 65.80%, which is fair for inpatients with BPD symptomatology.
Outcomes	High levels of NE predicted a higher probability of subsequent NSSI. Regarding the second condition, however, no indication was found for emotional relief after NSSI. Instead results showed that NSSI was related to an increase in NE, and a decrease in PE in the same interval, and a further increase in NE one time interval later. Therefore, at least on a time scale of hours, and based on the current sample, we found that NSSI was followed by an invigoration of, rather than relief from, negative emotion.

Reference	Muehlenkamp, J. J., Engel, S. G., Wadeson, A., Crosby, R. D., Wonderlich, S. A., Simonich, H., & Mitchell, J. E. (2009). Emotional states preceding and following acts of non-suicidal self-injury in bulimia nervosa patients. Behaviour Research and Therapy, 47(1), 83–87.
Aim of the study	To examine the temporal association between positive and negative emotional states prior to and consequent to acts of NSSI within a subset of bulimia nervosa patients.
Sample	131 female participants who met DSM-IV criteria for bulimia nervosa (M=25.3; SD=7.6). Of the 131 participants, 19 (14.5%) reported at least one act of NSSI during the study time period.
EMA method	Participants completed two weeks of EMA recordings. Signal-contingent recordings required individuals to respond to the palmtop computer in response to a signal (they were signaled at six semi-random times throughout the day). Participants reported their mood, stressors, BN symptoms, and self-injurious behaviors during these recordings. Selected items of PANAS were used to assess momentary affect. They also had to complete these ratings after the occurrence of a pre-identified behaviour (event-contingent recording). Items from several scales of eating disorder and self-destructive behavior were used to create a 19-item checklist of momentary behaviours. Only the self-injurious behavior items ('I cut myself', 'I scratched myself', 'I burned myself', 'I hit myself', and 'I banged my head') were used in this analysis.
Subject's adherence	Participants were given feedback regarding adherence to the protocol based on their practice data, and there was discussion concerning strategies with participants who needed to improve adherence rates. Women who agreed to participate in the study received $200 (for the two weeks of EMA) and were given an additional $50 bonus for compliance rates of 85% or more of the daily recordings.
Outcomes	Results indicate significant increases in negative affect, and decreases in positive affect, prior to an NSSI act. Post-NSSI, positive affect significantly increased while negative affect remained unchanged.

Reference	Nock, M. K., Prinstein, M. J., & Sterba, S. K. (2009). Revealing the form and function of self-injurious thoughts and behaviors: A real-time ecological assessment study among adolescents and young adults. Journal of Abnormal Psychology, 118(4), 816–827.
Aim of the study	To examine the basic form of Self-injurious Toughts and Behaviors (SITB) and to test which proximal factors predict the transition from self-injurious thoughts to self-injurious behaviors.
Sample	30 adolescents and young adults (12–19 years; M=17.3, SD = 1.9) who experienced NSSI thoughts in the past 2 weeks. 100% of the sample had NSSI episodes in past year
EMA method	Participation used a PDA to complete EMA during 14 days. It was programmed to beep twice daily (at midday and end-of-day) signaling the participant to complete an entry. In addition, participants were instructed to self- initiate an entry whenever they experienced a self-destructive thought or behavior. Participants responded to a brief structured series of multiple-choice questions at each data-entry. For both signal- and event-contingent entries, participants first were asked whether they had experienced a thought of engaging in any self-destructive behavior (currently or since the last assessment), including suicide attempt or NSSI, as well as others. If any self-destructive thought was reported, participants were asked follow-up questions regarding its characteristics, etc. They were then asked whether they had engaged in that behavior. If so, then they were asked follow-up multiple-choice questions regarding the intended function of the behavior, the actual consequences experienced, and the duration of the behavior. If not, then they were asked what they did instead of engaging in the behaviour
Subject's adherence	They were paid $100 or were allowed to instead keep the PDA ($135 value) if their compliance exceeded 80%. All participants completed the study, and 83.3% were fully compliant
Outcomes	NSSI is predicted by a greater intensity and shorter duration of NSSI thoughts than suicidal thoughts. When self injurious thoughts begin, adolescents were most often socializing or resting instead of using drugs. NSSI thoughts were accompanied by thoughts of suicide only 1.0%-4.2% of the time. Among episodes of NSSI thoughts, being alone was a significant predictor of engagement in NSSI. NSSI thoughts occurred most often in the context of feeling sad or anxious while NSSI were significantly increased in the presence of feelings of rejection or anger, but decreased in the presence of feeling sad/worthless. NSSI was mostly performed for intrapersonal reinforcement and the alternative behaviours reported focused on actively engaging in activities and less often on more passive behaviours like watching television or sleeping.

Reference	Pearson, C. M., Pisetsky, E. M., Goldschmidt, A. B., Lavender, J. M., Wonderlich, S. A., et al. (2016). Personality psychopathology differentiates risky behaviors among women with bulimia nervosa. International Journal of Eating Disorders, 49(7), 681–688.
Aim of the study	To examine how personality may differentiate engagement in risky behaviors such as self-harm and substance use among BN individuals.
Sample	133 women who met DSM-IV criteria for bulimia nervosa. Age range (18-55), (M= 25.3; S.D=7.6 years). The sample was predominantly Caucasian (95.5%) with at least some college education (80.5%).
EMA method	Participants were instructed to complete EMA recordings of mood and behavior in handheld computer for a 2-week period, each time they experienced certain behaviors; before bedtime; and in response to 6 semi-random prompts by investigators, which occurred every 2–3 h between 8:00 a.m. and 10:00 p.m. Behaviors to be recorded consisted of specific eating disorder bahaviors, self-harm (endorsement of one or more of the following four behaviors: intentionally cut, scratched, burned or hit oneself, or banged one's head); substance misuse (endorsement of one or more of the following two behaviors: got drunk, abused drugs) and reckless behaviors (endorsement of one or more of the following five behaviors: engaged in risky or unprotected sex, broke valued personal items, drove dangerously or recklessly, shop- lifted, or went on a spending spree).
Subject's adherence	
Outcomes	The unique associations of specific risky behaviors and combinations of risky behaviors with higher-order personality traits was tested. Findings suggested that personality is more strongly associated with engagement in substance misuse than other risky behaviors (such us NSSI), and evidence did not support the relevance of personality in relation to engagement in combinations of risky behaviors.

Reference	Santangelo, P. S., Koenig, J., Funke, V., Parzer, P., Resch, F., Ebner-Priemer, U. W., & Kaess, M. (2016). Ecological Momentary Assessment of Affective and Interpersonal Instability in Adolescent Non-Suicidal Self-Injury. Journal of Abnormal Child Psychology.
Aim of the study	To examine affective instability and instability of attachment to significant others in adolescents with NSSI compared to healthy controls. To examine if the number of BPD criteria met is positively correlated to heightened affective and interpersonal instability among adolescents with NSS
Sample	Female adolescents (M=15.92; SD=1.20) with NSSI (n = 26) and age and sex-matched healthy controls (n = 20) . The majority of participants in the NSSI group also fulfilled diagnostic criteria for BPD (73%).
EMA method	Participants received a study smartphone with an app on 2 consecutive weekends (4 days). The e-diary emitted a prompting signal according to a random time-sampling schedule on average once per hour (i.e., in 60 min intervals) with a target number of 12 assessments per person per day. To assess participants' current affective states it was used an adaption of the Multidimensional Mood Questionnaire designed for the usage in e-diary studies. Participants responded to the statement "at this moment I feel" by means of four bipolar items. Participants rated each item on a visual analog scale ranging from 0 to 100. To assess participants' current interpersonal states they answered four items regarding the momentary attachment to the participant's mother and four items regarding the momentary attachment to the best friend. The same items were used to assess momentary attachment to the participant's best friend. Participants rated each item on visual analog scales ranging from 0 to 100.
Subject's adherence	Participants received 12 Euros for taking part in the diagnostic interview and 1 Euro for every completed entry, given a minimum of 50% completed prompts. Even though overall compliance was good, significant group differences with respect to completed prompts emerged. Adolescents engaging in NSSI showed a significantly lower compliance compared to controls. However, controls' compliance was particularly high (over 90%) and NSSI patients' compliance was still good (75%)
Outcomes	Adolescents with NSSI reported less positive affect, lower levels of attachment to the mother, and best friend. Affective and interpersonal instability to mother were significantly greater in adolescents engaging in NSSI. In the NSSI group, the number of BPD criteria met was positively correlated with affective instability, and instability of attachment to the best friend, but not instability of attachment towards the mother

Reference	Shingleton, R. M., Eddy, K. T., Keshaviah, A., Franko, D. L., Swanson, S. A., Yu, J. S., Krishna, M., Nock, M.K & Herzog, D. B. (2013). Binge/purge thoughts in nonsuicidal self-injurious adolescents: an ecological momentary analysis. International Journal of Eating Disorders, 46(7), 684–9.
Aim of the study	To examine the frequency and co-occurrence of Bingeing/Purging (BP) thoughts/behaviors with self-injury and other self-destructive thoughts/behaviors in a sample of NSSI adolescents, and to investigate the context surrounding BP thoughts/behaviors.
Sample	Thirty adolescents (ages 12–19, M=17, SD=1.9) who reported engaging in NSSI within the past 2 weeks
EMA method	EMA data were captured using palm pilots over the spam of 14 days. Data collection involved event-contingent responses (i.e., participants were asked to self-initiate answers to questions whenever they experienced self-destructive thoughts/behaviors). Questions such as 'what were you doing [when you had the thought]?' and 'what led to the thought?' were asked each time the participant began an event-contingent recording. Self-destructive thoughts and behaviors assessed included suicide thoughts and behaviours, NSSI thoughts/behaviours, binge/ purge (BP) thoughts/behaviours, and 'other' self-destructive thoughts/behaviours. In the case that more than one thought was reported at a time, the palm pilots captured details on immediate physical, social, and emotional contexts of the most serious thought. Priority was given to suicidal thoughts first, NSSI thoughts next (if no suicidal thoughts), and otherwise the most serious other thought, defined by the adolescent as the thought they most seriously considered acting upon in that moment.
Subject's adherence	They were compensated $100 for participating and, if their compliance rate was 80% or greater, the adolescents had the option to keep the PDA device ($135 value).
Outcomes	BP thoughts were present in 22 (73%) participants. Seventy-nine percent of BP thoughts co-occurred with other self-destructive thoughts. Adolescents were more often with friends/peers than alone or with family when having BP thoughts more frequently than in NSSI thoughts. Worry and pressure precipitated both BP and NSSI thoughts, but perceived criticism and feelings of rejection/hurt were associated more often with BP thoughts than with NSSI thoughts. Negative emotions were present both before and while having BP and NSSI thoughts. Those who actually engaged in NSSI most frequently cited a desire to rid themselves of a thought/feeling as the reason for their behavior, In comparison, the reasons for BP behaviors were more ambiguous.

Reference	Turner, B. J., Cobb, R. J., Gratz, K. L., & Chapman, A. L. (2016). The role of interpersonal conflict and perceived social support in nonsuicidal self-injury in daily life. Journal of Abnormal Psychology, 125(4)
Aim of the study	To examined how interpersonal contingencies influence daily NSSI behavior.
Sample	60 adults with recent, repeated NSSI. Age range (18-35), (M=23.25; S.D= 4.25). The majority of participants were female (85%) and had completed some or all of a postsecondary degree (74%). Despite being a community sample, 80% of participants reported a history of psychiatric treatment and 40.4% reported the current use of psychotropic medications.
EMA method	Diaries were completed over 14 days. Participants completed a single daily report at the end of the day during which they are prompted to retrospectively report on different "episodes" within the day. For this study, participants rated NSSI urges, mood, conflict and perceived support separately within three predefined periods each day: morning (defined as the period between first waking up and noon), afternoon (defined as noon to 6 p.m.), and evening (defined as 6 p.m. until the diary entry).
Subject's adherence	Participants received $45 per week if they completed at least five of seven entries or $60 if they completed all seven entries, for a total compensation between $0 (<5 entries completed per week) and $120 (all 14 entries completed). Participants completed 735 out of the possible 840 diary entries, with an average of 12.10 entries per person
Outcomes	Daily conflict was associated with stronger same-day NSSI urges and greater likelihood of NSSI acts. Perceived support increased following NSSI acts that had been revealed to others, but not unrevealed NSSI acts. This perceived support was, in turn, associated with a stronger NSSI urges and greater likelihood of engaging in NSSI on the following day. Moreover, participants whose NSSI was revealed to others engaged in more total NSSI acts during the diary period than those whose NSSI was not revealed to others. Interpersonal conflict did not decrease following NSSI, regardless of whether or not these acts were revealed to others.

Reference	Turner, B. J., Wakefield, M. A., Gratz, K. L., & Chapman, A. L. (2017). Characterizing interpersonal difficulties among young adults who engage in nonsuicidal self-injury using a daily diary. Behavior Therapy, 48(3), 366–379.
Aim of the study	To characterize the day-to-day interpersonal experiences of young adults with recent repeated NSSI using a daily diary.
Sample	116 young adults (aged 18-35) (M=23.50; SD = 4.66). 77.6% were female. They reported either no history of NSSI (non-NSSI group) or a history of recent (i.e., past-year), recurrent (i.e., ≥ 10 lifetime episodes) NSSI and urges for or thoughts about NSSI in the two weeks prior to study enrolment (NSSI group).
EMA method	Participants were emailed each evening during two weeks with a link and password for the online diary questionnaires to complete as close to bedtime as possible. They reported whether they had contact with their romantic partner, family members or friends or peer(s) within each of the three diary periods (morning, afternoon and evening). If participants answered in the affirmative, they completed the Goldsmith Social Support Scaleto rate their satisfaction with the support they received from during that time period. Within each daily period, participants were asked to rate the presence or absence of 17 unpleasant interactions using the Test of Negative Social Exchange. Participants rated their affective state within each time period using the Multidimensional Mood Questionnaire. To assess daily coping, it was used a 15-item version of the Coping Strategy Indicator that was used at baseline. Participants were instructed to briefly describe a problem they had encountered and, to rate the extent to which they had used each coping strategy on a 3-point Likert-type scale
Subject's adherence	Participants were paid $30 for the diagnostic assessment, $30 for the laboratory session, and $45 if they completed at least five of seven diary entries during either of the two weeks or $60 if they completed all seven entries in either week. The majority of participants (86.2%) completed at least 12 of the 14 entries.
Outcomes	NSSI group had significantly less contact with their families and friends, perceived less support following interactions with friends, and were less likely to seek support to cope, regardless of level of negative affect. With the exception of contact with family members, these group differences in daily interpersonal functioning were accounted for by baseline levels of social anxiety and use of support seeking. Contrary to expectations, participants with NSSI had more frequent contact with their romantic partners, did not differ in perceptions of support in romantic relationships, and did not report more intense negative affect following negative interpersonal interactions.

Reference	Turner, B. J., Yiu, A., Claes, L., Muehlenkamp, J. J., & Chapman, A. L. (2016). Occurrence and co-occurrence of nonsuicidal self-injury and disordered eating in a daily diary study: Which behavior, when? Psychiatry Research, 246, 39–47.
Aim of the study	To examine and compare the emotional and social contexts of NSSI versus disordered eating (DE) as they occur in daily life among young adults who engage in both behaviors.
Sample	Young adults with recent, repeated NSSI. Age range (18-35). The final analyses focused on 25 participants (92% female; mean age=23.12; SD=3.81) who endorsed one or more episodes of NSSI and one or more episodes of DE (binge eating, purging, or fasting) during the diary period (two weeks)
EMA method	Diaries were completed over 14 days. Participants completed a single daily report at the end of the day during which they are prompted to retrospectively report on different "episodes" within three predefined periods: morning (defined as the period between first waking up and noon), afternoon (defined as noon to 6 p.m.), and evening (defined as 6 p.m. until the diary entry). They were asked whether they had engaged in NSSI, binge eating, purging, and fasting behaviors at any time that day. If NSSI or DE were endorsed, participants completed a standardized set of follow-up questions assessing the social and emotional context of each behavior
Subject's adherence	Participants who completed at least 5 of the 7 entries on either week received $45, and those who completed all 7 entries received $60 Participants completed a total of 318 valid diary entries, with an average of 12.72 entries per person .Rates of diary compliance were not related to age, gender ,baseline NSSI frequency or baseline eating disorder symptom severity.
Outcomes	NSSI and DE co-occurred approximately one third of the time. Participants were more likely to act on NSSI thoughts following arguments and feelings of rejection. They were more likely to act on binge eating/purging thoughts after eating or watching television, and when they felt self-hatred. They were more likely to act on fasting thoughts after discussing upsetting memories, and when they were in a public setting. NSSI days were marked by more intense negative mood in the evenings relative to fasting days, and greater fatigue in the morning relative to binge eating/purging days. This study underscores the utility of using experience-sampling methods to develop and test within-person models to advance our understanding of co-occurring behaviors

Reference	Vansteelandt, K., Houben, M., Claes, L., Berens, A., Sleuwaegen, E., Sienaert, P., & Kuppens, P. (2017). The affect stabilization function of nonsuicidal self-injury in Borderline Personality Disorder: An Ecological Momentary Assessment study. Behaviour Research and Therapy, 92, 41–50.
Aim of the study	To examine the affect stabilization function of NSSI in patients with BPD.
Sample	32 patients diagnosed with BPD, (84%) women, age (M=28, SD= 19)
EMA method	EMA data was captured using PDA and were prompted by signals scheduled 10 times a day for 8 days . The signals were programmed according to a stratified random interval time-series. At each signal, participants were asked to complete the EMA questionnaire. To assess core affect, one core affect word in each of the four quadrants of the core affect space was selected: stressed (negative valence, high activation), depressed (negative valence, low activation), cheerful (positive valence, high activation), and relaxed (positive valence, low activation). Each core affect word was preceded by the sentence: 'At this moment, I feel (core affect word)'. Items were presented in random order, and participants had to indicate the extent to which the questions were applicable to them at the moment of the signal using a slider (varying from 0 to 100). NSSI was measured with the following question: 'Since the previous signal, I have engaged in automutilation' with two answer categories ('yes' vs 'no').
Subject's adherence	Participants filled-out an average of 50 (63% of generated signals per person). Two participants were removed from the analysis because they responded to less than 20% of the scheduled signals.
Outcomes	Results indicated that individuals who engaged in NSSI show more within subject variance in valence and activation than individuals who did not engage in NSSI. However, within the NSSI patients, individuals who engaged more frequently in NSSI during the study showed less within subject variance in valence and activation than patients who engaged less frequently in NSSI. This suggests that NSSI may be reinforced by its affect stabilization function.

Reference	Victor, S. E., & Klonsky, E. D. (2014). Daily emotion in non-suicidal self-injury. Journal of Clinical Psychology, 70, 364–375.
Aim of the study	This study investigated the specific emotions that are characteristic of those who engage in NSSI.
Sample	University students with either no history or a recent history of NSSI completed daily diary and retrospective measures of emotional experience. 27 had engaged in NSSI with tissue damage in the past 6 months. 84 participants were included in these analyses, 60 (71.4%) were female. Participants' ages ranged from 19 to 43 years, with a mean of 23.3 (SD = 5.1).
EMA method	The daily diary measures took approximately five minutes per day to complete, and were completed as close to the end of each day as possible. The diary was completed using an electronic data collection system participants accessed from home. While a majority of participants completed the daily diary using an online survey service, participants were also provided with the option to complete the diary in paper format; two participants selected this option for some or all of their diary entries. Participants were asked to report the number of times over the course of the day that they engaged in twelve NSSI behaviors (e.g., cutting, burning, and hitting), with the option to enter an 'other NSSI' frequency. Participants were asked to complete a measure of 20 specific emotions (10 positive, 10 negative) that they may have experienced over the course of each day. For each emotion, participants were asked to make three ratings indicating the emotion's frequency, intensity, and duration for that day.
Subject's adherence	While participants typically completed a majority of diary entries (median = 11, mean [M] = 10.8, standard deviation [SD] = 2.9), there was a nontrivial amount of missing data: 23% of expected days' entries were missing.
Outcomes	Results indicate that self-injurers experience greater negative emotionality, particularly self-dissatisfaction, compared to individuals with no NSSI history. Self-injurers also reported less positive emotion, but these effects were smaller. The pattern of results was similar when controlling for Axis I psychopathology and borderline personality disorder symptoms.

Reference	Wright, A. G. C., Hallquist, M. N., Stepp, S. D., Scott, L. N., Beeney, J. E., Lazarus, S. A., & Pilkonis, P. A. (2016). Modeling heterogeneity in momentary interpersonal and affective dynamic processes in borderline personality disorder. Assessment, 23(4), 484–495.
Aim of the study	To demonstrate assessment and analytic methods that capture both between-person differences and within-person changes over time, investigating idiographic "situational signatures" (i.e., the dynamic patterning of interpersonal perception, behavior, and affect during social interactions) in a sample of individuals diagnosed with BPD.
Sample	Twenty-five participants diagnosed with BPD. Of these, five were selected as exemplars for detailed presentation.
EMA method	Participants submited records about their mood, behavior, and interpersonal interactions every day for 21 days. Instructions specified that records were to be completed immediately following every interpersonal interaction that lasted at least 10 minutes. The diaries assessed the participants' own inter-personal behavior, their perception of their interaction partner's interpersonal behavior, and the participant's affect. Additional questions targeted contextual information about the nature of the interaction, including the interaction partner's relationship to the participant. When multiple interaction partners were present, participants selected which one to rate. Each record also included items assessing violence, substance use and self-harm during the interpersonal interactions. For self-harm assessment the questions were the following: "Did you have an urge to harm yourself on purpose?, Did you threaten to harm yourself on purpose?, Did you do anything to harm yourself on purpose?". If participants endorsed engagng in self-harm behavior, they indicated the method of self- harm (e.g., cut oneself, burned oneself, punched oneself).
Subject's adherence	In the sample of individuals diagnosed with BPD, participants completed a median of 74 valid interpersonal event recordings
Outcomes	Dynamic factor analysis found considerable heterogeneity in the resulting structures in a sample of 25 individuals diagnosed with BPD. In two of the five exemplar cases there was a positive relation between negative affectivity and self-harm.

Reference	Zaki, L. F., Coifman, K. G., Rafaeli, E., Berenson, K. R., & Downey, G. (2013). Emotion differentiation as a protective factor against nonsuicidal self-injury in borderline personality disorder. Behavior Therapy, 44, 529–540
Aim of the study	To examine whether differentiation of negative emotion was associated with lower frequency of NSSI acts and urges in individuals with BPD who reported histories of NSSI.
Sample	38 participants diagnoded with BPD. 84% of the simple were female (M=29.89, SD=10.60). To compare levels of rumination and emotion differentiation in BPD to those found in healthy participants, they were also recruited 42 control participants (83% female), (M=32.50, SD=7.53).
EMA method	Differentiation of negative emotion was assessed using a 21-day computerized experience-sampling diary that emitted signals at random intervals five times daily. At each electronic diary entry, participants rated on a 5-point Likert scale the extent to which they were currently experiencing a list of distinct negative emotions. The emotions included afraid, angry, ashamed, disappointed, irritated, sad, and tense. Intermixed with these emotion words, participants also rated a number of positive emotions (e.g., satisfied, energetic, happy, enthusiastic, relaxed, grounded, calm, and self-confident), which were not included in the calculation of the negative emotion differentiation index. NSSI acts and urges were also assessed at each electronic diary entry with the following prompt: 'Please indicate whether you injured yourself directly since the last diary'. Participants were then asked to select a response from the following options: 'No'; 'No, but I thought about it'; 'No, but I had a strong urge'; or 'Yes'.
Subject's adherence	The BPD and control groups completed a mean of 75.71 out of a possible 105 diary entries.
Outcomes	A significant rumination by negative emotion differentiation interaction revealed that rumination predicted higher rates of NSSI acts and urges in participants with difficulty differentiating their negative emotions.

6.3. COPIA DE LOS TRABAJOS PUBLICADOS

6.3.1. Artículo 1

Rodríguez-Blanco, L., Carballo-Belloso, J.J., De León, S. y Baca-García, E (2020). A longitudinal study of adolescents engaged in NSSI: clinical follow up from adolescence to young adulthood. *Psychiatry Research* (297)

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A longitudinal study of adolescents engaged in Non-Suicidal Self Injury (NSSI): clinical follow-up from adolescence to young adulthood

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ABSTRACT

The main aim of the current study is to examine the demographic and clinical factors that predict a continuity of the use of Mental Health Services (MHS) in adulthood by subjects who have engaged in non-suicidal-self-injury behaviors (NSSI) and have been followed in MHS in their teen years. A cohort of 147 participants was selected from an original sample of 267 adolescent patients recruited from the Child and Adolescent Outpatient Psychiatric Services. Patients were divided into two groups: those who had engaged in NSSI (NSSI-group), and those who had not (non-NSSI-group). Rate of use of MHS in adulthood was calculated for both groups and univariate analyses and binary logistic regression analysis were applied. In the NSSI-group, two factors appeared to influence a continuity of the use of MHS in adulthood. Prosocial behavior was associated with a greater use of MHS in adulthood whereas behavioral problems were associated with less use. Only prosocial behavior was maintained in the regression model as a predictor. Our findings could have implications for clinical practice with NSSI patients and highlight the importance of working on specific areas that could prevent treatment abandonment in the transition from adolescence to adulthood.

1. Introduction

Non-Suicidal Self Injury (NSSI) is defined as the direct and deliberate destruction of body tissue without suicidal intent (Nock & Favazza, 2009). Conceptualization and assessment of NSSI has evolved substantially in recent years and has even been included as a distinct syndrome in the section 'Conditions for Further Study' in the DSM-V (American Psychiatric Association, 2013). However, some recent critiques based on cumulative research into NSSI disorder (NSSI-D) question the clinical utility of the proposed diagnostic criteria and recommend a more dimensional approach (Buelens et al., 2020; Hooley et al., 2020). For instance, Criterion A, concerning the frequency and duration of NSSI, defined as "five or more occasions over one year", does not provide a meaningful distinction between the groups. Moreover, number and type of NSSI motivations (B) seems to be very restricted and the criterion corresponding to an association between the behavior or its consequences and clinically significant distress or impairment (E) is potentially problematic, since NSSI is often used to improve mood and alleviate distress (Hooley et al., 2020). In our study, we assessed the behavior and not the syndrome, since we consider the behavior to also have clinical relevance.

NSSI onset typically occurs during adolescence (Cipriano et al., 2017; Klonsky et al., 2014; Muhlenkamp & Gutierrez, 2007) and prevalence rates are high in both clinical and epidemiological samples. Prevalence in non-clinical samples is over 17.2% in adolescents, 13.4% in young adults, and 5.5% in adults (Swannell et., 2014). Prevalence in

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clinical samples is less well-defined and usually involves inpatient samples. The estimated prevalence in clinical adolescent inpatient samples is around 50% (Glenn & Klonsky, 2013; Kaess et al., 2013). We only found one study that reported prevalence in a clinical outpatient sample of adolescents and this was estimated to be around 22% (Díaz de Neira, 2014). Studies in clinical outpatient samples are uncommon, yet are necessary due to the challenges of managing this behavior in an outpatient setting.

Garcia Nieto et al. (2015) and Díaz de Neira (2014) studied the clinical characterization of a clinical outpatient adolescent population. These authors found that NSSI was associated with difficulties in emotional and behavioral domains measured with the Strengths and Difficulties Questionnaire (Marzocchi et al., 2004), with depression symptoms measured with the Children Depression Inventory (Del Barrio et al., 2002) and with anger internalization (STAXI-NA; Del Barrio et al., 2006). Family functioning (APGAR; Bellón et al., 1996) was found to be a protective factor against NSSI (Díaz de Neira, 2014). Despite the increase in information related to adolescent NSSI clinical characterization in recent years, the clinical evolution of subjects who engaged in NSSI during their adolescence is not well documented, and raises more questions than answers (Whitlock & Selekman, 2014).

In general, there has been an increase in NSSI longitudinal studies over the last ten years, although these are still scarce, and most of them only cover short-term follow-up periods. Moreover, few studies are carried out in clinical samples (Adrian et al., 2019; Glenn et al., 2017; Groschwitz et al., 2015; Prinsten et al., 2010). Studies tend to focus on determining which factors longitudinally predict future NSSI, and have shown that past NSSI is one of the best predictors (Cox et al., 2012; Glen & Klonsky, 2011; Wichstrøm, 2009). However, they do not usually consider factors related to a patient's clinical follow-up, nor do they account for gaps between the different developmental stages. We found some recent longitudinal studies that examined the clinical evolution from adolescence to young adulthood in clinical samples. Adrian et al. (2019) explored the growth of non-NSSI over time and highlighted the stable nature of NSSI and the contribution of emotion dysregulation and internalizing symptoms to NSSI patterns. Groschwitz et al. (2015) studied the clinical evolution of former adolescent self-injurers in young adults in a clinical outpatient sample. They collected data from 52 former adolescent mental health patients with NSSI aged between 18 and 30 years old at the time of the study. They found that although NSSI can decline over time, this psychopathology tends to prevail in young adulthood. Two thirds of participants still met criteria for an axis I psychiatric disorder in adulthood, and 61.5% of participants met criteria for an axis II condition. Nevertheless, 54% of all participants reported not receiving any mental health treatment. Moreover, early onset NSSI was found to be a risk factor for adult Borderline Personality Disorder and was highly associated with suicidal thoughts and behaviors.Fig 1

With the high prevalence of NSSI and its association with elevated psychopathology, suicide attempts, and the substantial financial burden this implies for society (Hauber et al., 2019), NSSI can be considered a major public health concern (Glenn et al., 2017). The lack of treatment of NSSI entails not only a significant personal cost, but is also costly for society.

As far as we know, no studies focus on the continuity or abandonment of mental health services (MHS) during follow-up in patients who have engaged in NSSI. It is important to comprehend which factors are related to the continuity or abandonment of mental health treatment from adolescence to young adulthood, since a high percentage of NSSI adolescents continue with mental health problems during their adult lives (Groschwitz et al., 2015). Moreover, detection of these factors could help clinicians to design strategies to target them and to improve adherence to treatment.

A recent systematic review that studied the factors affecting adolescent adherence to mental health treatment (Timlin et al., 2015) reported that adolescents own positive beliefs towards their treatment, and good cohesion with close supportive people appeared to be positively related to adherence, whereas sociodemographic characteristics were not related. "Good cohesion with close supportive people" is linked to the concept of secure attachment, that has also been associated with a better adherence to treatment in other pathologies (Benett et al., 2011; Ciechanowski et al., 2001). On the other hand, behavioral problems such as antisocial behaviors and behavioral disorders identified during adolescence have been associated with a worse adherence to treatment in chronic illness in young people (Bryden et al., 2001).

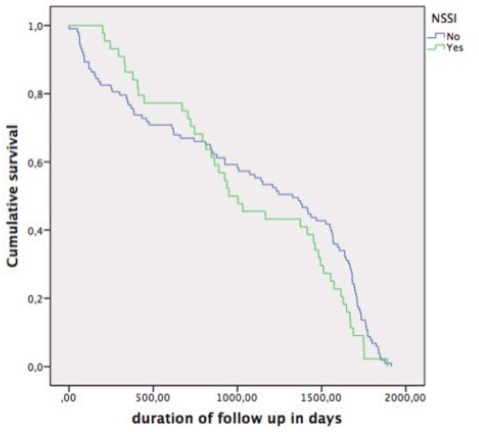

Fig. 1. Survival analysis of NSSI and non-NSSI groups

The aims of the current study were twofold. The first was to describe the clinical characteristics (including clinical follow-up from adolescence to young adulthood) of former adolescent patients engaged in NSSI. The second was to determine which demographic and clinical factors are related to the continuity or abandonment of mental health treatment from adolescence to young adulthood.

2. Methods

2.1. Participants and procedure

A cohort of 147 adult subjects were selected from an original sample of 267 adolescent patients recruited from the Child and Adolescent Outpatient Psychiatric Services of University Hospital Jiménez Díaz Foundation (Madrid, Spain) from November 2011 to October 2012. In the original study (Díaz de Neira 2014; García-Nieto et al., 2015), participants were assessed in several areas. We have follow-up data on these patients until 31st December 2016. Subjects older than 18 years at that date (147) have been included in the present study.

All participants were administered the Spanish version of the Self-Injurious Thoughts and Behaviors Interview –SITBI– (Garcia-Nieto et al., 2013), which is a structured interview that assesses the presence, frequency, and characteristics of suicidal ideation, suicide plans, suicide gestures, suicide attempts, and non-suicidal self injury. Participants were also administered the Spanish adaptation of the Children's Depression Inventory –CDI– (Del Barrio et al., 2002) that measures depressive symptoms, and the Spanish adaptation of the Family APGAR –APGAR– (Bellón et al., 1996) that measures the extent to which a family works as a unit. Participants and parents, or legally authorized representatives, were administered the Spanish version of the Strengths and Difficulties Questionnaire –SDQ– (Marzocchi et al., 2004) that measures psychological adjustment and general psychopathology. Sociodemographic data were obtained by a semi-structured interview.

Clinical follow-up data on the number and type of consultations from 2011 to 2016 were obtained from the clinical records of participants who were adults in December 2016. The abandonment or maintenance

of mental health treatment was also recorded. Patients who had been discharged were not included in the analysis.

Written informed consent at first assessment was obtained from patients who agreed to participate and their parents or legally authorized representatives. Subjects under 11 years old, subjects over 18 years old, and/or those who lacked the capacity to comprehend the questionnaires used in the study were excluded. The Jiménez Díaz Foundation Ethics Committee approved the study.

2.2. Data analysis

For purposes of analysis, subjects were first divided into two groups: NSSI (patients who had engaged in NSSI according to SITBI) and non-NSSI (patients who had not engaged in NSSI according to SITBI). Univariate analyses using chi-square and t-test were performed to characterize the sample and to compare both groups. Sociodemographic and clinical measures were analyzed. Some clinical measures were not included in this analysis since they had already been reported in a previous study (Díaz de Neira, 2014). We also performed a survival analysis during clinical follow-up.

Subsequently, we performed univariate analyses in each group to compare the clinical and sociodemographic characteristics of patients who continued with treatment after the age of 18 and patients who did not.

A regression analysis was carried out to establish the magnitude of the association between certain measures and continued treatment. We performed binary logistic regression analyses with all the significant variables as predictors of follow-up after the age of 18.

3. Results

Only patients aged 18 years or older on 31st December 2016 were selected from the original sample (2011-2012). The mean age of this selected sample was 19.8 years (SD=1.4; min=18 yrs, max=23 yrs) in December 2016. Data from these 147 subjects is presented in this paper.

3.1. Sociodemographic characteristics of the sample

Participants were assessed for the first time in 2011-2012. The sample was comprised of 61.4% men and 38.6% women, with a mean age of 15 years old (SD=1.3) at the time of the first assessment. Most subjects were Spanish 83% and 45.5 % of participants had repeated a school year at least once. Sociodemographic characteristics were similar in both the NSSI and non-NSSI groups (Table 1).

3.2. Clinical characteristics of the sample

The clinical characteristics of the total sample and of NSSI and non-NSSI groups in relation to self-harm behaviors and clinical follow-up are shown in Table 2.

Table 1
Sociodemographic Characteristics of the Sample

Sociodemographic characteristics	Total N= 147	NSSI N=44	Non NSSI N=103	t / x^2	df	p value
Sex (% males)	61.2% (90)	59.1% (26)	62.1% (64)	0.120	1	.85
Age ($M \pm SD$)	15.34 (± 1.3)	15.32 (± 1.5)	15.35 (± 1.2)	0.132	145	.90
Country of origin (% Spanish)	83% (122)	77.3 % (34)	85.4 % (88)	1.456	1	.24
Repeated a grade (% repeated at least once)	45.5 % (65/143)	50% (22/44)	43.4 % (43/99)	0.530	1	.47

Note. p values significant at the
*$p < .05$ level (bilateral)

Table 2
Clinical Characteristics of the Sample

	Total N= 147	NSSI N=44	Non NSSI N=103	t / x^2	df	p value
Self-harm behaviors						
Lifetime suicidal ideation	25.9 % (38)	47.7 % (21)	16.5% (17)	15.679	1	.00**
Lifetime suicidal planification	4.1 % (6)	6.8 % (3)	2.9 % (3)	1.228	2	.54
Lifetime suicidal gesture	11.6 % (17)	18.2 % (8)	8.7 % (9)	2.784	2	.25
Lifetime suicidal attempt	6.8 % (10)	13.6 % (6)	3.9 % (4)	4.995	2	.08
Follow-up						
Outpatient consultations	21 (± 15.8)	25 (± 19.6)	19 (± 13.5)	-2.077	145	.04*
Hospitalizations	1.2 (0.4)	1.25 (0.5)	1 (0)	-0.667	4	.54
Emergencies	2.7 (2.1)	3.40 (2.6)	1.75(1)	-1.189	7	.27
Maintain follow up after 18 years old	65.3% (96)	65.9% (29)	65% (67)	0.010	1	1.00

Note.
*$p < .05$,
**$p < .01$.

The occurrence of other self-harm behaviors (suicidal ideation, suicide planning, suicidal gesture and suicidal attempt) was always higher in the group of NSSI. However, differences only reached statistical significance for suicidal ideation ($\chi2 = 15.679$ $p < 0.001$).

The NSSI group received more consultations on average than the non-NSSI group ($t = -2.077$ $p = .04$). The average number of hospitalizations and emergencies were similar in both groups. However, four of the total six hospitalizations occurred in the group of NSSI, and five of the total nine emergencies.

A total of 65.3% of the sample continued receiving mental health follow-up after the age of 18, with no differences between the NSSI (65.9%) and non-NSSI groups (65%) ($\chi2 = 0.010$ $p = 1.000$). The average follow-up time in days during the study period was 1078 (S.D= 617) (three years) and there were no differences in the survival curves between NSSI and non-NSSI (Fig.1). Median survival times for NSSI and non-NSSI groups were 949 and 1328 days, respectively ($\chi2 = 1.769$ $p = 0.183$).

3.3. Differences between groups who continued or abandoned treatment

3.3.1. Differences in the NSSI group

We compared the sociodemographic and clinical characteristics of NSSI patients who remained in follow-up after 18 years old (greater continuity of the use of MHS) and patients who left treatment before this age (less continuity of the use of MHS). We found that the percentage of suicidal gestures and attempts were higher in the group of patients that left treatment, although these differences were not statistically significant. Emotional measures (CDI, SDQ emotional) were more severe in the group of patients that remained in treatment (greater continuity of the use of MHS), while other clinical measures (rest of SDQ scores and family Apgar) were more severe in the group of patients that left treatment before the age of 18. However, these differences were only statistically significant in SDQ-A Conduct ($t = 2.121$ $p = 0.000$) (more behavioral problems were recorded in the adolescent group that left treatment) and SDQ-P Prosocial ($t = -2.086$ $p = 0.044$) (better prosocial behavior measured by parents in the group remaining in treatment). (See supplemental material. Table S1)

3.3.2. Differences in the non-NSSI group (Control group)

We compared the sociodemographic and clinical characteristics of non-NSSI patients who remained in follow-up after 18 years old and

patients who left treatment before this age.

We did not find statistically significant differences in any measure between the groups (see supplemental material. Table S2).

3.3.3. Regression model

Calibration was evaluated using the Hosmer-Lemesow goodness of fit test obtaining good results ($\chi 2 = 4.027$ $p = 0.545$). The only variable that remained in the regression model was "SDQ-P Prosocial". NSSI patients with higher "SDQ-P Prosocial" score were more prone to remain in treatment (OR= 1.22, 95% CI 1.03-1.44) (Table 3).

4. Discussion

In this naturalistic study, the objectives were to describe the clinical characteristics of former adolescent patients engaged in NSSI and to examine which demographic and clinical factors were associated with continuity or abandonment of mental health treatment from adolescence to young adulthood.

Since we already knew other clinical differences between NSSI adolescent patients and non-NSSI adolescent patients in this sample from previous studies (Díaz de Neira, 2014; Garcia-Nieto et al., 2015), we only reviewed self-harm behaviors and clinical follow-up. Suicidal ideation, suicide planning, suicide gesture and suicidal attempt were always higher in the NSSI group. However, the prevalence of these behaviors was low and, probably because of this, only suicidal ideation (higher rate) reached statistical significance. Suicidal ideation was more common in the NSSI group, which agrees with previous studies in the literature that reported that suicidal behavior and NSSI frequently coexist (Nock et al., 2006). NSSI has even been considered an important risk factor for suicide (Grandclerc et al., 2016; Whitlock et al., 2013). Nevertheless, the actual extent of this relationship remains unclear and is beyond the scope of our study.

Regarding the clinical follow-up of the sample, we found that the NSSI group received more consultations, probably due to the fact that NSSI is related to increased psychopathology and risk of suicide (Ougrin et al., 2012). However, we did not find differences in the total time of clinical follow-up, and more than a third of patients abandoned mental health treatment before reaching young adulthood in both groups. Therefore, abandonment in this transition appears to be generalized and not specific to NSSI, and might be partially influenced by how mental health services are structured. Patients are treated by child and adolescent services until the age of 18, at which point they are treated in adult services. Although this transition is facilitated in our services (both services are located in the same place and specialists coordinate with each other) many young people are at risk of disengagement (Broad et al., 2017; Cleverley et al., 2020; Pai, 2011). We also found other factors that influenced abandonment or continuity of treatment, such as behavioral problems and prosocial behavior. Behavioral problems were more common in NSSI patients who abandoned treatment, which is in line with the study of Bryden et al. (2001). This finding is not surprising if we consider some characteristics inherent to behavioral problems, such as difficulties in establishing relationships and following rules (Ogundele, 2018). In addition, behavioral problems before adulthood have been associated with antisocial features and even criminality in adulthood (Murray et al., 2015; Pardini et al., 2018; Satterfield et al., 2007). This could complicate the continuity of mental health treatment during adulthood, as some of these patients end up in different clinical settings or other institutions, such as social services or penitentiary service. The fact that this was only significant in the NSSI group might be related to the fact that behavioral problems are more prominent in NSSI patients (Díaz de Neira, 2014). Complementary to this, we found that prosocial behavior was the only variable that predicted adherence to treatment in NSSI. Our results are corroborated by the direct association between prosocial behavior and secure attachment (Gross et al., 2017; Mikulincer & Shaver, 2015) and the fact that secure attachment has already been related to a better adherence to treatment in certain pathologies (Benett et al., 2011; Ciechanowski et al., 2001, Timlin et al., 2015). NSSI has been associated with insecure attachment (Cassels et al., 2019; Martin et al., 2017; Tatnell et al., 2014), hence working on establishing a trusting relationship and prosocial behavior should be a priority.

Table 3
Summary of Logistic Regression Analyses for Variables Predicting Treatment Maintenance in NSSI patients

Predictor	*B*	*SE B*	OR (95% CI)
SDQP Prosocial	0.20*	0.09	1.22 (1.03-1.44)
Constant	-0.77	0.65	0.49

Note.
*$p < .05$ OR= Odds Ratio

We found that the percentage of suicidal gestures and attempts were higher in the group of NSSI patients that left treatment. Although these differences were not statistically significant (the sample size was small), they are still interesting. This result contrasts with our findings for the non-NSSI group. In the non-NSSI group we did not find clinical differences between patients that continued and left treatment. In this case, the abandonment of treatment seems to be more related to factors inherent to the transition between health services previously discussed. Unlike the non-NSSI group, the group of NSSI patients that left treatment present distinct psychopathology and higher suicidal risk. It, therefore, seems even more important to try to retain NSSI patients with behavioral problems and/or suicidal gestures and attempts.

Our findings could have important implications for clinical practice with NSSI patients, as they highlight the importance of working on specific aspects of adolescents, such as prosocial behavior, which can influence the continuity of mental health treatment. Avoiding mental health treatment abandonment in the transition from adolescence to young adulthood of NSSI patients could also prevent the evolution to other serious problems such as suicide and personality disorders.

All these findings should be interpreted in the context of the limitations of the present study. Clinical variables were only measured at the start of mental health treatment and were not analyzed at the end of treatment, when they could well have changed. Moreover, the sample size was small and some of the frequencies were low; hence we must be cautious when drawing conclusions and regard these results as provisional. Further research is therefore warranted to confirm our findings.

Nevertheless, to the best of our knowledge, this is the first study that longitudinally focuses on the clinical follow-up of NSSI patients from Child and Adolescent Mental Health Services to Adult Mental Health Services. It has important clinical implications, providing clues to help improve mental health follow-up in these patients.

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6. Author statement

The authors declare that consent was obtained for experimentation with human subjects. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).

All individuals included as authors have substantially contributed to the scientific process leading up to the writing of the paper, and have

contributed to drafting and critical revision of the manuscript. All authors have approved the final submitted version.

Declaration of Conflicting Interests

All the authors declare that they have no conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2021.113711.

References

Adrian, M., Zeman, J., Erdley, C., Whitlock, K., Sim, L., 2019. Trajectories of non-suicidal self-injury in adolescent girls following inpatient hospitalization. Clin. Child. Psychol. Psychiatry. 24 (4), 831–846.

American Psychiatric Association., 2013. Diagnostic and statistical manual of mental disorders, 5th ed. Washington, APA.

Bellón, J.A., Delgado, A., Luna, J.D., Lardelli, P., 1996. Validez y fiabilidad del cuestionario de función familiar Apgar-familiar. Atención Primaria 18 (6), 289–296.

Bennett, J.K., Fuertes, J.N., Keitel, M., Phillips, R., 2011. The role of patient attachment and working alliance on patient adherence, satisfaction, and health-related quality of life in lupus treatment. Patient Educ. Couns. 85 (1), 53–59. https://doi.org/10.1016/j.pec.2010.08.00.

Broad, K.L., Sandhu, V.K., Sunderji, N., Charach, A., 2017. Youth experiences of transition from child mental health services to adult mental health services: a qualitative thematic synthesis. BMC Psychiatry 17 (1), 380.. https://doi.org/10.1186/s12888-017-1538-1.

Bryden, K.S., Peveler, R.C., Stein, A., Neil, A., Mayou, R.A., Dunger, D.B., 2001. Clinical and psychological course of diabetes from adolescence to young adulthood: A longitudinal cohort study. Diabetes Care 24, 1536–1540.

Buelens., T, Luyckx, K., Kiekens, G., Gandhi, A., Muehlenkamp, J.J., Claes, L., 2020. Investigating the DSM-5 criteria for non-suicidal self-injury disorder in a community sample of adolescents. Journal of Affective Disorders 260, 314–322.

Cassels, M., Baetens, I., Wilkinson, P., Hoppenbrouwers, K., Wiersema, J.R., Van Leeuwen, K., Kiekens, G., 2019. Attachment and Non-Suicidal Self-Injury among Young Adolescents: The Indirect Role of Behavioral Problems. Arch. Suicide Res. 23 (4), 688–696. https://doi.org/10.1080/13811118.2018.1494651.

Ciechanowski, P.S., Katon, W.J., Russo, J.E., Walker, E.A., 2001. The patient-provider relationship: attachment theory and adherence to treatment in diabetes. Am J Psychiatry 158 (1), 29–35. https://doi.org/10.1176/appi.ajp.158.1.29.

Cipriano, A., Cella, S., Cotrufo, P., 2017. Nonsuicidal Self-injury: A Systematic Review. Front. Psychol. 8, 1946. https://doi.org/10.3389/fpsyg.2017.01946.

Cleverley, K., Rowland, E., Bennett, K., Jeffs, L., Gore, D., 2020. Identifying core components and indicators of successful transitions from child to adult mental health services: a scoping review. Eur. Child Adolesc. Psychiatry. 29 (2), 107–121. https://doi.org/10.1007/s00787-018-1213-1.

Cox, L.J., Stanley, B.H., Melhem, N.M., Oquendo, M.A., Birmaher, B., Burke, A., Kolko, D. J., Zelazny, J.M., Mann, J.J., Porta, G., Brent, D.A., 2012. A longitudinal study of nonsuicidal self-injury in offspring at high risk for mood disorder. J. Clin. Psychiat 73 (6), 821–828. https://doi.org/10.4088/JCP.11m07250.

Díaz de Neira, M., 2014. Características psicopatológicas, acontecimientos vitales estresantes y conductas autolesivas suicidas y no suicidas en adolescentes evaluados en salud mental. Universidad Autónoma de Madrid, Madrid.

Del Barrio, V., Roa, M.L., Olmedo, M., Colodron, F., 2002. Primera adaptación del CDI a la población española. Acción Psicológica 3, 263–272.

Del Barrio, V., Spielberger, C.D., Aluja, A., 2006. STAXI-NA. Inventario de Expresión de Ira Estado-Rasgo en niños y adolescentes. first ed. TEA Ediciones.

García-Nieto, R., Blasco-Fontecilla, H., Paz Yepes, M., Baca-García, E., 2013. Translation and validation of the "Self-Injurious Thoughts and Behaviours Interview" in a Spanish population with suicidal behaviour. Revista de Psiquiatría y Salud Mental 6 (3), 101–108. https://doi.org/10.1016/j.rpsmen.2012.07.004.

García-Nieto, R., Carballo, J.J., Hernando, M.D., de, N., León-Martínez, V., Baca-García, E., 2015. Clinical Correlates of Non-Suicidal Self-Injury (NSSI) in an Outpatient Sample of Adolescents. Arch. Suicide Res. 19 (2), 218–230. https://doi.org/10.1080/13811118.2014.957447.

Glenn, C.R., Klonsky, E.D., 2011. Prospective prediction of nonsuicidal self-injury: A 1-year longitudinal study in young adults. Behav. Ther. 42 (4), 751–762. https://doi.org/10.1016/j.beth.2011.04.005.

Glenn, C.R., Klonsky, E.D., 2013. Nonsuicidal self-injury disorder: an empirical investigation in adolescent psychiatric patients. J. Clin. Child. Adolesc. Psychol. 42 (4), 496–507.

Glenn, C.R., Lanzillo, E.C., Esposito, E.C., Santee, A.C., Nock, M.K., Auerbach, R.P., 2017. Examining the Course of Suicidal and Nonsuicidal Self-Injurious Thoughts and Behaviors in Outpatient and Inpatient Adolescents. J. Abnorm. Child Psychol. 45 (5), 971–983. https://doi.org/10.1007/s10802-016-0214-0.

Grandclerc, S., De Labrouhe, D., Spodenkiewicz, M., Lachal, J., Moro, M.-R., 2016. Relations between Nonsuicidal Self-Injury and Suicidal Behavior in Adolescence: A Systematic Review. PloS One 11 (4), e0153760. https://doi.org/10.1371/journal.pone.0153760.

Groschwitz, R.C., Plener, P.L., Kaess, M., Schumacher, T., Stoehr, R., Boege, I., 2015. The situation of former adolescent self-injurers as young adults: A follow-up study. BMC Psychiatry 15.

Gross, J.T., Stern, J.A., Brett, B.E., Cassidy, J., 2017. The multifaceted nature of prosocial behavior in children: Links with attachment theory and research. Soc. Dev. 26 (4), 661–678. https://doi.org/10.1111/sode.12242.

Hauber, K., Boon, A., Vermeiren, R., 2019. Non-suicidal Self-Injury in Clinical Practice. Front. Psychol. 10. https://doi.org/10.3389/fpsyg.2019.00502.

Hooley, J.M., Fox, K.R., Boccagno, C., 2020. Nonsuicidal Self-Injury: Diagnostic Challenges And Current Perspectives. Internet NeuropsychiatR. Dis. and Treat. 16, 101–112.

Kaess, M., Parzer, P., Mattern, M., Plenner, P., Bifulco, A., Resch, F., 2013. Adverse childhood experiences and their impact on frequency, severity, and the individual function of nonsuicidal self-injury in youth. Psychiatry Res 206, 265–272.

Klonsky, E.D., Victor, S.E., Saffer, B.Y., 2014. Nonsuicidal Self-Injury: What We Know, and What We Need to Know. Can. J. Psychiatry. 59 (11), 565–568.

Martin, J., Bureau, J.-F., Lafontaine, M.-F., Cloutier, P., Hsiao, C., Pallanca, D., Meinz, P., 2017. Preoccupied but not dismissing attachment states of mind are associated with nonsuicidal self-injury. Dev. Psychopathol. 29 (2), 379–388. https://doi.org/10.1017/S0954579417000050.

Marzocchi, G.M., Capron, C., Di Pietro, M., Duran Tauleria, E., Duyme, M., Frigerio, A., Gaspar, M.F., Hamilton, H., Pithon, G., Simões, A., Thérond, C., 2004. The use of the Strengths and Difficulties Questionnaire (SDQ) in Southern European countries. Eur. Child. Adoles. Psy. 13 (2) https://doi.org/10.1007/s00787-004-2007-1 ii40-ii46.

Mikulincer, M., Shaver, P.R., 2015. An Attachment Perspective on Prosocial Attitudes and Behavior. The Oxford Handbook of Prosocial Behavior, 10.1093/oxfordhb/9780195399813.013.010.

Muehlenkamp, J.J., Gutierrez, P.M., 2007. Risk for suicide attempts among adolescents who engage in non-suicidal self-injury. Arch. Suicide Res. 11 (1), 69–82. https://doi.org/10.1080/13811110600992902.

Murray, J., Menezes, A.M.B., Hickman, M., Maughan, B., Gallo, E.A.G., Matijasevich, A., Gonçalves, H., Anselmi, L., Assunção, M.C.F., Barros, F.C., Victora, C.G., 2015. Childhood behaviour problems predict crime and violence in late adolescence: Brazilian and British birth cohort studies. Soc. Psychiatry. Psychiatr. Epidemiol. 50 (4), 579–589. https://doi.org/10.1007/s00127-014-0976-z.

Nock, M.K., Favazza, A.R., 2009. Nonsuicidal self-injury: Definition and classification. In Understanding nonsuicidal self-injury: Origins, assessment, and treatment. American Psychological Association. 9–18. https://doi.org/10.1037/11875-001.

Nock, M.K., Joiner, T.E., Gordon, K.H., Lloyd-Richardson, E., Prinstein, M.J., 2006. Non-suicidal self-injury among adolescents: diagnostic correlates and relation to suicide attempts. Psychiatry Res 144 (1), 65–72. https://doi.org/10.1016/j.psychres.2006.05.010.

Ogundele, M.O., 2018. Behavioural and emotional disorders in childhood: A brief overview for paediatricians. World J. Clin. Pediatr. 7 (1), 9–26.

Ougrin, D., 2012. Practitioner review: Self-harm in adolescents. J. Child Psychol. Psychiatry, and allied disciplines. 53 (4), 337–350.

Pai, A.L.H., Ostendorf, H.M., 2011. Treatment adherence in adolescents and young adults affected by chronic illness during the health care transition from pediatric to adult health care: A literature review. Child. Health Care. 40 (1), 16–33.

Pardini, D.A., Byrd, A.L., Hawes, S.W., Docherty, M., 2018. Unique Dispositional Precursors to Early-Onset Conduct Problems and Criminal Offending in Adulthood. J. Am. Acad. Child Adolesc. Psychiatry 57 (8), 583–592. https://doi.org/10.1016/j.jaac.2018.04.013.

Prinstein, M.J., Heilbron, N., Guerry, J.D., Franklin, J.C., Rancourt, D., Simon, V., Spirito, A., 2010. Peer influence and nonsuicidal self injury: Longitudinal results in community and clinically-referred adolescent samples. J. Abnorm. Child. Psychol. 38 (5), 669–682. https://doi.org/10.1007/s10802-010-9423-0.

Satterfield, J.H., Faller, K.J., Crinella, F.M., Schell, A.M., Swanson, J.M., Homer, L.D., 2007. A 30-year prospective follow-up study of hyperactive boys with conduct problems: adult criminality. J. Am. Acad. Child. Adolesc. Psychiatry. 46 (5), 601–610. https://doi.org/10.1097/chi.0b013e318033ff59.

Swannell, S.V., Martin, G.E., Page, A., Hasking, P., St John, N.J., 2014. Prevalence of nonsuicidal self-injury in nonclinical samples: systematic review, meta-analysis and meta-regression. Suicide Life Threat. Behav. 44 (3), 273–303. https://doi.org/10.1111/sltb.12070.

Tatnell, R., Kelada, L., Hasking, P., Martin, G., 2014. Longitudinal analysis of adolescent NSSI: the role of intrapersonal and interpersonal factors. J. Abnorm. Child Psychol. 42 (6), 885–896.

Timlin, U., Hakko, H., Heino, R., Kyngäs, H., 2015. Factors that Affect Adolescent Adherence to Mental Health and Psychiatric Treatment: a Systematic Integrative Review of the Literature. Scand. J. Child Adolesc. Psychiatr. Psychol. 3 (2), 99–107.

Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Baral Abrams, G., Barreira, P., Kress, V., 2013. Nonsuicidal self-injury as a gateway to suicide in young adults. J. Adolescent Health. 52 (4), 486–492. https://doi.org/10.1016/j.jadohealth.2012.09.010.

Whitlock, J., Selekman, M.D., 2014. Nonsuicidal Self-Injury Across the Life Span. The Oxford Handbook of Suicide and Self-Injury. https://doi.org/10.1093/oxfordhb/9780195388565.013.0010.

Wichstrøm, L., 2009. Predictors of non-suicidal self-injury versus attempted suicide: similar or different? Arch. Suicide Res. 13 (2), 105–122. https://doi.org/10.1080/13811110902834992.

6.3.2. Artículo 2

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Use of Ecological Momentary Assessment (EMA) in Non-Suicidal Self-Injury (NSSI): A systematic review

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ABSTRACT

Conceptualization and assessment of non-suicidal self-injury (NSSI) has evolved substantially in recent years. In both cross-sectional and longitudinal studies, NSSI and its related variables have traditionally been assessed retrospectively, leading to less precise studies of the mechanisms involved in the maintenance, cessation, or aggravation of this behavior. Ecological momentary assessment (EMA) enables real-time collection of patient states, which can be very useful in the study of the mechanisms implied in this behavior. This systematic review aims to elucidate the current status of EMA use in NSSI investigation. An exhaustive search in PubMed and PsycINFO was conducted up to September 2017. All papers included were focused on the study of NSSI using EMA. Studies with methodological diversity were included, which were afterwards organized according to main topic of studies. There were no ineligibility criteria based on age or diagnosis. Twenty-three papers were studied, the majority of which are short-term studies focused on the study of affect dynamics and the emotion-regulation function of NSSI. Implications of these results and recommendations for future research are discussed.

1. Introduction

Non-suicidal self-injury (NSSI) has been defined as a direct and deliberate damage of body tissue without suicidal intent (Nock and Favazza, 2009). Traditionally, NSSI was considered a specific manifestation of borderline personality disorder (BPD). However this behavior is not specific to any diagnosis. It appears transdiagnostically, and can even be present in non-clinical populations. The greatest risk for NSSI behavior occurs in adolescence. The reported prevalence of NSSI in non-clinical samples is around 23% in adolescents, 13.4% in young adults, and 5.5% in adults (Swannell et al., 2014).

NSSI and its related variables are frequently assessed retrospectively, both in cross-sectional and longitudinal studies. This approach introduces a memory bias and is less conducive to the understanding of the mechanisms involved in the maintenance, cessation, or aggravation of this behavior. Few studies have conducted a continuous follow-up of NSSI samples. This is required to establish the evolution of this behavior and the mechanisms that mediate the behavior. Ecological momentary assessment (EMA) enables us to cope with these difficulties, allowing for the gathering of real-time, real-world data, on certain behaviors, symptoms, and states of the subject, thus increasing data precision (Stone et al., 1999).

EMA does not represent a single methodology, much less a particular technology, but rather a collection of methods that share a daily diary approach to the individuals subjected to this type of investigation (Shiffman et al., 2008). Assessment scheduling in EMA can vary based on the study aim. So-called 'event-contingent' assessments are linked to events, such as occasions when the subject is about to undertake or has just undertaken a particular behavior (Reis and Gable, 2000). Another approach to EMA is to schedule assessments for certain times, which is known as 'time-based assessments' (Delespaul, 1995; Reis and Gable, 2000). This timing is sometimes scheduled at random to provide a representative and unbiased estimate of the typical state of the subjects (Bolger et al., 2003). Different modes of assessment can also be combined (Shiffman et al., 2008; Shiffman, 2014).

EMA methods can range from the use of paper and pencil methods

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to the most advances technologies (Intille, 2007). As expected, nowadays mobile phones and web-based applications are most commonly used in EMA. This implies a greater precision and realism of data since they permit the verification of the time of entry and thus allow for detailed analysis of compliance. Moreover, evidence supports that people are more direct on online health questionnaires than during face-to-face interviews (Bennett and Glasgow, 2009), especially regarding sensitive areas in psychiatry, such as suicidal thoughts and/or behavior (Barak, 2007).

EMA may facilitate the testing of certain theories in relation to NSSI, an increasingly prevalent behavior. Thus, although suicidal behavior and NSSI are considered as different entities, both behaviors frequently coexist (Nock et al., 2006). In fact, NSSI seems to be an important risk factor for suicide after adjusting for other risk factors (Andover and Gibb, 2010; Whitlock et al., 2013). It has been hypothesized that NSSI is a gateway facilitating adolescents to attempt suicide (Grandclerc et al., 2016). Nevertheless, the factual extent of this relation between NSSI and suicidal behavior remains unclear. Accurate monitoring of NSSI with EMA could shed some light on this crucial area. Particularly important would be to identify the events recorded in the NSSI population that predict suicidal behavior or attempts during follow-up. Since self-monitoring of a behavior can decrease its frequency (Maas et al., 2013), EMA may represent a positive intervention on NSSI behavior. In addition, considering that mobile phones and new technologies are a central part of the lifestyle of adolescents, the major population at risk for NSSI, EMA methodology seems appropriate as a study tool.

EMA methods are used in several clinical psychology domains (Shiffman, 2008) such us anxiety (Walz et al., 2014), affective disorders (Putnam and McSweeney, 2008), psychosis (Myin-Germeys et al., 2011), eating disorders (Forbush and Hunt, 2014), substance use disorders (Shiffman, 2009) or borderline personality disorder (Hasler et al., 2014). In spite of this, studies in NSSI using this approach are scanty. Davidson et al. (2017) have reviewed the utilization of EMA in 5 studies on self-injurious behaviors of which only 3 are of a non-suicidal character (NSSI). In our paper, we have identified and reviewed 23 studies utilizing EMA in NSSI individuals. Such a deeper review is justified for several reasons: 1) NSSI should be isolated from 'deliberate self-harm', a category that includes conditions unrelated to NSSI, such as suicidal ideation, and planning or attempting to commit suicide, 2) the concept of NSSI has evolved substantially in recent years and it has been included as a distinct syndrome among the 'Conditions for Further Study' section of the American Psychiatric Association (DSM-V), and 3) EMA is one of the most recently introduced evaluation methodologies in mental health sciences, and its value in a currently highly prevalent and worrisome behavior such as NSSI, deserves a profound evaluation.

Our paper is aimed at reviewing the utilization and yield of EMA in populations exhibiting NSSI behavior. We will examine the methods employed and the current value and limitations of EMA to improve the understanding of NSSI. An important purpose of our review is to examine the diversity of manners in which EMA is applied in NSSI literature.

2. Methods

The present review was conducted in accordance with the PRISMA guidelines (Liberati et al., 2009). In Table 1 we summarize the scope of our review.

2.1. Study eligibility criteria

2.1.1. Population

The criteria to define our target population were broad, to cope with the diversity of studies published so far. The target population included subjects who were engaged in NSSI, regardless of diagnosis or age. The only exclusion criterion was a cognitive impairment that could interfere with a self-monitoring of behavior, such as an IQ under 85, or a concomitant neurological disease.

Table 1
Eligibility criteria.

Criteria	Operational definition
Object of study	Use of ecological momentary assessment in NSSI studies
Population	People engaged in NSSI. No reported cognitive impairment. No age restriction.
Type of study	Original scientific paper, indexed in PubMed or PsycInfo database before September 19, 2017
Language	Papers published in English or Spanish

2.1.2. Intervention/assessment

The search was focused on studies reporting on the use of EMA in NSSI. Outcomes of the EMA assessment were not a selection criterion but the results of the subsequent self-monitoring were included in our final analysis.

2.1.3. Type of study

Our only selection criterion was an EMA component in the samples of the selected studies. Our search has included original randomized and non-randomized clinical trials, and investigations following other designs (experimental, quasi-experimental and descriptive studies). We have not incorporated in our study review articles (systematic and non-systematic) and meta-analyses. We did not impose any chronological restriction for the selection of studies to include as many of them as possible.

2.2. Search strategy

To perform our search, we have used the electronic databases PubMed and PsycINFO. When these resources did not provide a full text version of the papers, we obtained them through the library resources of our institution. In all instances, we have had access to the full text version of the included papers. The last search was conducted on September 19, 2017. The strategies used when searching the literature are specified in Table 2.

As indicated, we have selected all original indexed papers in which the use of EMA in NSSI is explicitly mentioned, regardless of their comorbid diagnosis and their previous history of other self-injurious behaviors, including suicide. We have not considered papers solely referring to other behaviors, such as substance abuse, binge eating and vomiting, or suicidal ideation or attempts. Examples of excluded studies are those using EMA in relation to eating disorders (Lavender et al., 2013a, 2013b), or BPD (Ellison, 2014), but not including NSSI behavior. We have also excluded studies initially appearing in our search but addressing totally unrelated topics (Bunning, 1998; Meany-Daboul et al., 2007; Özcan et al., 2015) and review papers without an original investigation (Armey, 2012; Armey et al., 2015; Hamza and Willoughby, 2015; McKenzie, 2014). Finally, we excluded two other studies because their definition of 'self-harm' didn't include NSSI behavior (Evans, 1999; Humber, 2013).

Following an initial search, we performed a second-level exploration using the bibliographic references of papers identified in our primary quest that were related to the aim of our review. We used the same inclusion and exclusion criteria as those employed in the primary search.

2.3. Study selection and data collection

To determine the eligibility of the studies, two authors (JC and LR) reviewed the abstracts of the selected papers, independently. When there was a disagreement, the inclusion or exclusion of the paper was decided by consensus. We then obtained the full text version of all studies that met the eligibility criteria. We extracted the following items

Table 2
Search strategy.

	PsycINFO	PubMed
Search	*("NSSI" OR "nonsuicidal self directed violence" OR "self mutilation" OR "automutilation" OR "self-injury" OR "self-harm" OR "self-injurious behavior" OR "self-cutting")* ***AND*** *("Ecological Momentary Assessment" OR "experience sampling method" OR "ambulatory assessment" OR "intensive time sample" OR "momentary time sampling" OR "daily diary")*	*(("self mutilation"[Title/Abstract] OR"automutilation"[Title/Abstract] OR "self-injury"[Title/Abstract] OR "self-harm"[Title/Abstract] OR "self-injurious behavior"[Title/Abstract] OR "self-cutting"[Title/Abstract]))* ***AND*** *("Ecological Momentary Assessment" OR "experience sampling method" OR "ambulatory assessment" OR "intensive time sample" OR "momentary time sampling" OR "daily diary")*
Filters	Abstract	Title/Abstract
Last entry	9/19/2017	9/19/2017
Number of references	26	31

by using predefined forms: aim of study, sample size and characteristics, EMA method employed, adherence of the subjects to EMA, and clinical outcomes. A data sheet covering these items was completed for each selected study (see Appendix). The same two authors completed the sheet for each selected study, independently. We then compared both sheets of each study, and disagreements were sorted out through consensus. Factors hypothesized to be associated with between-study heterogeneity included: primary research focus (NSSI, deliberate self-harm, or another behavior), assessed outcomes, mode of assessment, period of follow-up, and the presence of any kind of incentive for participation or completion of assessments.

3. Results

We selected 23 articles from the 35 references found in the two searches (32 through the primary search and 3 following the second-level search). In Fig. 1 we show the flow diagram for inclusion in our evaluation. Key aspects of selected studies are compiled in Table 3.

As expected, most of studies were focused on the investigation of daily life variables that might influence the occurrence or maintenance of NSSI. To facilitate the understanding of the findings provided by EMA, we have grouped the results in different, not mutually exclusive, categories: context in which NSSI occurs (16 studies), motives that lead to NSSI (3 studies), emotional or social changes after the NSSI (7 studies), and other potential mechanisms that may influence or predict the behavior (8 studies).

3.1. Description of the studies selected

3.1.1. NSSI context

We found multiple studies describing the context (including cognitions, emotions and situations) in which NSSI occurs. Only one study (Nock et al., 2009) was focused on pre-injury cognitions. This study was aimed at investigating the transition from self-injurious thoughts to self-injurious behaviors, revealing that the occurrence of NSSI was predicted by a greater intensity and shorter duration (1–30 min) of NSSI thoughts the opposite to the less prevalent suicidal thoughts.

Several studies examined the affective or emotional context of NSSI. Most of them describe a pre-injury increase in negative affect (NA) in different populations. Muehlenkamp et al. (2009) found a significant increase in NA and a decrease in positive affect (PA) prior to NSSI in patients diagnosed with bulimia nervosa (BN). Armey et al. (2011) also

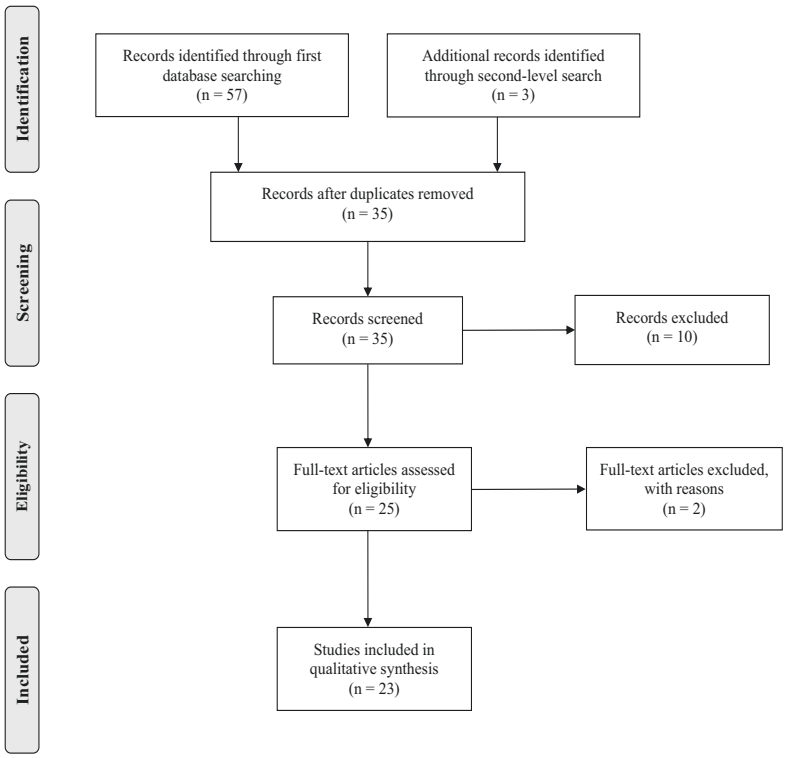

Fig. 1. Flow diagram of the inclusion of the studies from the literature search.

Table 3
Selected studies.

Authors	Population	Frequency and type of EMA	Duration of assessment	EMA measures
Ammerman et al. (2017)	Adults with BPD and a comorbid depressive disorder	4 time contingent assessments per day	7 days	Self-injurious behavior, urge to hurt themselves, negative affect and emotional experiences of feeling impulsive
Andrewes et al. (2016) and Andrewes et al. (2017)	Youth (15–25 years old) with BPD	6 time contingent assessments per day	6 days	Self-injurious thought and/or NSSI behavior (forms and context)
Anestis et al. (2012)	Adults with Bulimia Nervosa (BN)	6 time semi random contingent assessments per day and event-contingent assessment when participants experience behaviors from a set of behaviors listed	14 days	Eating disorder and self-destructive behaviors, affect, mood, stress, and other behaviors
Armey et al. (2011) and Armey et al. (2012)	College students with a self-reported history of NSSI	6 time contingent assessments per day and event-contingent assessment experience when NSSI occured	7 days	Affect, emotional experience, NSSI behavior
Bentley et al. (2017)	Adults that meet criteria for NSSI disorder (DSM-V)	1 time contingent assessments per day and event-contingent assessment experience when NSSI occured	Up to 12 weeks	NSSI urges and acts
Bresin et al. (2013) and Bresin (2014)	College students with a self-reported history of NSSI	1 time contingent assessments	14 days	NSSI urges and acts, affect Unpleasant and pleasant events
Horowitz and Stermac (2017)	Community young adults with a self-reported history of NSSI	1 time contingent assessments per day	21 days	NSSI urges or acts
Houben et al. (2017)	Inpatient adults with BPD	10 time contingent assessments per day	8 days	Emotions, NSSI
Muehlenkamp et al. (2009)	Adults with BN	7 time contingent assessments per day, event contingent assessment when participants experienced NSSI or other dysregulated behaviors	14 days	Mood, stressors, BN symptoms, self-injurious behaviors, momentary affect
Nock et al. (2009b)	Adolescents and young adults with a self-reported history of NSSI.	2 time contingent assessments per day and event-contingent assessment when participants experience self- directed violence thoughts or behaviors	14 days	Suicide attempt, NSSI, Substance use, Binging, Purging, Impulsive Spending, Unsafe Sex (Function, Consequence, and Duration of NSSI)
Pearson et al. (2016)	Adults with BN	1 time contingent assessments per day	14 days	Mood, eating disorder behaviors, NSSI (form); substance misuse and reckless behaviors
Santangelo et al. (2016)	Female adolescents with history of NSSI, and possible BPD (73% of the sample)	12 time contingent assessments per day	4 days	Affect, interpersonal states (attachment)
Shingleton et al. (2013)	Adolescentes engaging in NSSI	Event-contingent assessments when participants experienced self-destructive thoughts/behaviors.	14 days	Suicide thoughts and behaviors, NSSI thoughts/behaviors, binge/ purge thoughts/behaviors, and 'other' self-destructive thoughts/behaviors.
Turner et al. (2016a) and Turner et al. (2016b) and Turner et al. (2017)	Adults with recent NSSI	1 time contingent assessments per day	14 days	NSSI urges, mood, conflict and perceived support. Binge eating, purging, and fasting behaviors. Social contact, coping strategies
Vansteelandt et al. (2017)	Adults with BPD	10 time contingent assessments per day	8 days	Affect, NSSI occurrence
Victor and Klonsky (2014)	University students with recent history of NSSI and control group	1 time contingent assessments per day	14 days	NSSI behaviors (form and frequency), emotions
Wright et al. (2016)	Adults with BPD	Event-contingent assessments following every interpersonal interaction that lasted at least 10 min	21 days	Mood, behavior, and interpersonal interactions including violence, substance use and self-harm during the interpersonal interactions
Zaki et al. (2013)	Adults with BPD	5 time contingent assessments per day	21 days	Positive and negative emotions, NSSI acts and urges

indicated that college students experienced increases in NA detectable hours before the NSSI event ($M = 7.82$ h; S.D = 8.32). Andrewes et al. (2016) found a pattern of increasing NA and decreasing PA prior to NSSI in a sample diagnosed with BPD, as well as an increase in negative complex emotions, defined as two or more co-occurring negative emotions (Andrewes et al., 2017). Like Armey et al. (2011), they found that the changes in NA and PA occurred several hours before the engagement in the behavior (a median of 15 and 10 h prior to NSSI, respectively). Victor and Klonsky (2014) reported that individuals engaging in NSSI experienced greater negative emotionality, particularly self-dissatisfaction, and to a lesser extent reduced positive emotions. These results were similar when controlling for Axis I psychopathology and BPD symptoms. Houben et al. (2017) and Wright et al. (2016) also found that an increased NA predicted a higher probability of NSSI in BPD patients and Turner et al. (2016b) found that NSSI days were marked by a more intense negative mood. Also related to NSSI engagement are emotional variability (Santangelo et al., 2016; Vansteelandt et al., 2017; Victor and Klonsky, 2014), and difficulties in emotional differentiation (Bresin, 2014; Victor and Klonsky, 2014; Zaki et al., 2013).

Some studies have examined the emotional context regarding NSSI thoughts in adolescents or young adult samples. Shingleton et al. (2013) found that worry and pressure precipitated both binging-purging (BP), and NSSI thoughts. Nock et al. (2009) encountered that NSSI thoughts occurred most often in the context of feeling sad or anxious, while NSSI behavior was significantly increased with feelings of rejection or anger, but decreased in the presence of feeling sad/worthless. Turner et al. (2016b) also found feelings of rejection in the context of NSSI behavior.

Regarding the environmental and relational context of NSSI, Andrewes et al. (2016), in a sample of young people diagnosed with BPD, found that, when asked openly, 46% declared to be unaware of what was happening just prior to engaging in NSSI. When the question was addressed offering several options, Nock et al. (2009) found that being alone was a significant predictor of NSSI in a sample of adolescents and young adults. Shingleton et al. (2013) studying the BP thoughts in NSSI adolescents reported that participants were more often with friends/peers when NSSI was combined with BP (40.5%) or BP only (50.0%) thoughts were present, compared to those experiencing NSSI-only (30.4%) thoughts. Santangelo et al. (2016) reported lower levels of attachment to the mother and best friend in NSSI adolescents as compared to normal controls. Turner et al. (2017) found that NSSI young adults as compared with a non-NSSI similarly aged group, had significantly less contact with their families and friends, and perceived less support after interactions with friends. In a previous study, Turner et al. (2016a) reported several important observations: 1) perceived support increased following NSSI when revealed to others, 2) that this support was associated with increased NSSI urges and greater likelihood of engaging in NSSI on the next day, and 3) participants revealing NSSI to others engaged in more frequent NSSI acts during a 2-week EMA period, than subjects not disclosing their behavior to others.

3.1.2. NSSI motives

We found three studies that examined the explicit motives of NSSI as reported by the participants. When participants were explicitly asked about the reasons for their behavior after NSSI episodes, they most commonly reported engaging in NSSI to reduce their distress, but one-third of participants were unable to identify their motivations for this behavior (Andrewes et al., 2016). Shingleton et al. (2013) found that a desire to rid themselves of a thought/feeling was the most common reason. Nock et al. (2009) also found that intrapersonal-negative reinforcement was the most common function of the behavior, followed by intrapersonal-positive reinforcement and much less often for interpersonal reinforcement.

3.1.3. Changes produced from before to after NSSI

Various studies have explored the role of changes in affect just prior to and directly after NSSI behavior. Armey et al. (2011), Andrewes et al. (2016) and Andrewes et al. (2017) found a decrease in NA after NSSI engagement. On the other hand, Houben et al. (2017) have encountered an increase in negative emotions after NSSI engagement. Andrewes et al. (2016) and Muehlenkamp et al. (2009), reported on an increase in PA after NSSI, although the latter did not find changes in NA after NSSI.

Only the study of Turner et al. (2016a) has examined the issue of variations related to social response after NSSI. As mentioned above, these investigators found that participants perceived an increased support following NSSI acts when the latter were revealed to others. Although this increased perceived support was associated with stronger NSSI urges and an increased risk for a repeat episode on the following day. Interpersonal conflict did not decrease following NSSI, regardless of whether these acts were revealed to others or not.

3.1.4. Other potential mechanisms

Aside from the implication of affect, some studies have tested for the influence of other variables on NSSI behavior. These studies generally combine EMA measures and traditional measures of different variables.

Bresin et al. (2013) and Ammerman et al. (2017) examined the relation between affect and impulsivity in NSSI. Bresin et al. (2013) found that impulsivity and daily sadness predicted an urge to engage in NSSI. However, in participants with low impulsivity, sadness was unrelated to NSSI urge. Ammerman et al. (2017) found that urges to hurt oneself and impulsive urges, but not daily NA or aggressive urges, predicted NSSI. They also found that low levels of distress tolerance (behavioral measure) was a stronger predictor of NSSI behavior than daily experiences. Zaki et al. (2013) in a sample of patients with BPD found that rumination predicted higher rates of NSSI acts and urges in subjects who had difficulties differentiating their negative emotions.

EMA has been applied not only for assessing the occurrence of NSSI but also for evaluating the frequency or severity of this behavior according to different mechanisms. In females diagnosed of bulimia nervosa, affective lability and past suicidal behavior were significantly related to the number of NSSI episodes as disclosed with an EMA methodology (Anestis et al., 2012). High levels of cumulative life trauma also evidenced greater in vivo NSSI severity following both high and low levels of NA (Armey et al., 2012). Trauma severity has also been related with a wider range of NSSI functions and with specific NSSI functions like interpersonal boundaries purposes and anti-dissociation aims (Horowitz et al., 2017).

EMA methodology has also been employed to examine the effect of psychological interventions on the reduction of NSSI episodes. Bentley et al. (2017) reported fewer NSSI urges and acts after emotion-focused interventions.

Finally, we have found only one study addressing the association between higher-order personality traits and NSSI using EMA (Pearson et al., 2016). This investigation concluded that higher-order personality factors, which were strongly associated with engagement in substance misuse, did not show relation with NSSI behavior or other risky behaviors.

4. Discussion

Our review of 23 original studies using EMA in NSSI engaged populations shows that daily diary approaches provide valuable new information in real time on the links between this behavior and an ample number of variables such as context, emotional states, personality traits, trauma, social and emotional relations…etc.

EMA studies have been mainly focused on the emotional, rather than on the cognitive or situational contexts. These investigations have revealed a trend for an increment in NA levels before NSSI engagement. This suggests that the NSSI behavior may entail an emotion-regulation function (Nock, 2010). In addition, Andrewes et al. (2016) and Armey

et al. (2011) have studied with EMA the accurate timing of events, showing that changes in affect take place hours before NSSI episodes, thus providing an opportunity to design potential preventive interventions.

It is of interest to note that NSSI thoughts and NSSI behaviors appear in different contexts. While thoughts tend to be elicited in relation to feelings of sadness and anxiety (Nock et al., 2009; Shingleton et al., 2013) the NSSI behavior appears more frequently in solitude (Nock et al., 2009) and in association with feelings of rejection (Nock et al., 2009; Turner et al., 2016b), or anger (Nock et al., 2009). These findings indicate that the concept of 'negative affect' is too broad and that emotional, cognitive and situational contexts must be defined more specifically to identify the reasons conducting to the jump from thoughts to behaviors.

Several studies have shown an intrapersonal negative reinforcement as the most frequent motive for NSSI when the motivations were explicitly examined after NSSI engagement (Andrewes et al., 2016; Nock et al., 2009; Shingleton et al., 2013). This is in consonance with investigations that have found a decrease of negative affect after NSSI engagement (Andrewes et al., 2016, 2017 and Armey et al., 2011). In contrast, Houben et al. (2017) found an invigoration of negative emotions after NSSI engagement. However, the study of Houben differs from the others in two aspects: 1) it is the only one carried out in a sample of inpatients in whom NSSI behavior is likely to be reprimanded; 2) the frequency of assessments was 10 times per day, higher than in the other aforementioned investigations.

A few studies have examined PA changes after NSSI suggesting a positive reinforcement function of NSSI (Andrewes et al., 2016; Muehlenkamp et al., 2009; Turner et al., 2016a). This area should be explored further. NSSI behavior may have similarities with addiction mechanisms in which a positive reinforcement plays a role in the initial stages, and a negative reinforcement prevails in subsequent phases.

Most of the studies analyzed here have focused on the evaluation of affect or emotion when applying EMA. In the last section of the results, we describe some studies also considering the influence of other distal and proximal variables that may influence NSSI behavior. Several studies have established that certain mediating and moderating variables are necessary to explain the behavior beyond affective factors, such us impulsivity (Ammerman et al., 2017; Bresin et al., 2013), rumination (Zaki et al., 2013), or significant distal events (Anestis et al., 2012; Armey et al., 2012).

NSSI social functions and correlates have not been extensively studied, though they play an important role in the initiation, maintenance, and cessation of NSSI. In our review we found that lower levels of attachment to the mother and best friend (Santangelo et al., 2016), lower social contact with family and friends, and lower perceived support after interactions (Turner et al., 2017), were related to NSSI occurrence. Turner et al. (2016a) found that NSSI acts revealed to others increased the perceived support in contrast to unrevealed NSSI acts; although, the larger perceived support after NSSI increased NSSI urges and acts. The latter may occur because the NSSI act exerts a positive reinforcement function. A negative reinforcement probably plays no role since in this study, independently of whether these acts were revealed to others or not, the interpersonal conflict did not decrease following NSSI behavior (Turner et al., 2016a). Two non-EMA studies also indicate that NSSI individuals disclose their behavior to others. Muehlenkamp et al. (2013) found that 59% of individuals with repetitive NSSI episodes revealed to others their behavior despite reporting low perceived social support from family members, and few individuals from whom to seek advice. Baetens et al. (2011) also found that more than half of an NSSI sample communicated their behavior to someone else.

Many NSSI subjects have difficulties reporting the motives of their behavior (Andrewes et al., 2016). Others have found that in 65% of NSSI episodes, adolescents reported an intrapersonal- negative reinforcement motive, followed by intrapersonal-positive (25%), and much less often for the purposes of interpersonal-negative (15%) and interpersonal-positive (4%) reinforcement (Nock et al., 2009). It is possible that participants have difficulties in recognizing the relation between NSSI and an ultimate intention to generate changes in their social environment. In some cases, regulation of affective experience and social situations can coexist and then, the social function of NSSI might be obscured by the emotion-regulation function when the participant is invited to reply to a questionnaire. While the EMA methodology can use fixed inquiry forms, it also allows us to study the precipitants and the effects of certain behaviors without explicitly providing predefined answers to the questions. This approach should be considered in future studies to explore the social function of NSSI, assessing familial and other interpersonal factors related to NSSI behavior.

As mentioned before, NSSI rates in adolescents are high and occur in both clinical and non-clinical samples. We know that self-injurious thoughts and behaviors are more prevalent among adolescents than in adults (Nock, 2010). Despite this, it should be noted that only five of the studies meeting our inclusion criteria recruited adolescents in the sample, and only two of them involved adolescents exclusively. Given the lack of representation of adolescents in the current literature, it is difficult to compare them with the adult population. More studies on adolescents with NSSI behavior are badly needed. Given the importance of interpersonal and familiar relations in adolescence, the social function of NSSI might be more relevant in this young population than in adulthood.

We did not find meaningful differences between clinical and non-clinical samples. Indeed, some of the main findings such as a trend for increased NA before NSSI engagement appeared in both clinical and non-clinical populations. As Victor and Klonsky (2014) reported that when controlling for Axis I psychopathology and BPD symptoms, the greater rates of negative emotionality and lower positive emotions in NSSI subjects as compared to controls, were maintained. It is possible that these so-called non-clinical samples include more subjects with psychopathology than it is expected.

EMA methodology utilized in the studies included in this review was not uniform (Table 3). The number of daily assessments varied from 1 to 12 and their duration from 4 days to up to 12 weeks. The adherence of the recruited subjects was not reported in all studies. Information from papers mentioning the adherence to EMA assessment indicates that the lowest figures were found in a non-clinical sample of college students (compliance rate 38%), (Armey et al., 2011). Relatively low figures of adherence were also found in studies requesting more than six assessments per day and when participants were not remunerated according to the degree of compliance (Andrewes et al., 2016, 2017; Armey et al., 2011; Vansteelandt et al., 2017). Nevertheless, studies that implied longer periods of assessment did not conveyed lower adherence (Bentley et al., 2017; Horowitz et al., 2017; Wright et al., 2016 and Zaki et al., 2013).

Studies performed in adolescent NSSI individuals are not only scarce, but also have consisted of small sample sizes. In the studies reviewed the recruited individuals were predominantly females. The majority of the EMA and diary studies so far reviewed employed short assessment periods. New studies recruiting lager samples of adolescents and with longer periods of follow-up are needed to understand NSSI better and to develop strategies to address this behavior. The use of smart-phones rather than other alternatives to complete the questionnaires may contribute to increase the compliance rate in this age population. Also of consideration is the number and the timing of assessments demanded per day using EMA to achieve a high compliance rate. Finally, we should seek information on the relations between NSSI and other self-aggressive conducts as well as the risk of progression to more dangerous behaviors such suicidal ideation, planning or attempt.

All these new investigations using EMA in NSSI could have relevant clinical implications as they may allow professionals to act effectively according to certain warning signals. The adoption of EMA methodology for NSSI individuals may help clinicians to monitor their

interventions, and help patients to be more conscious of their own processes.

Regarding the limitations of this study, it is worth noting the heterogeneity among the studies. The wide inclusion criteria adopted in this review have increased the variability among methodologies and in the specific aims of the studies. The primary research focus was NSSI, but some studies included other self-injurious behaviors or thoughts. Nevertheless, the different behaviors were well-defined and differentiated from NSSI. Regarding the content of the studies, between-study heterogeneity included sample sizes and characteristics, variability in assessed outcomes, mode of implementing EMA, period of assessment and follow-up, adherence, and additional diagnoses. While this variability does not enable us to draw generalizable conclusions, our selection criteria allowed us to include a higher number of studies and reach the main objective of this review, which was to examine the current state of NSSI study through EMA.

In conclusion, EMA is a valuable tool in the study of NSSI, and one that has already revealed interesting data in this area. However, the number of studies implementing this methodology is still scarce. Most of the studies are focused on the investigation of the context in which NSSI occurs, use EMA in a short-term basis, have recruited small samples, and the representation of the adolescent population is very insufficient. We need powered, long-term prospective EMA studies, including different NSSI populations, particularly adolescents. This is crucial if we want to identify reliable predictors of progression to more risky behaviors and strategies to modify worrisome dysfunction.

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Conflict of interest

All the authors declare that they have no conflicts of interest.

References

Ammerman, B.A., Olino, T.M., Coccaro, E.F., McCloskey, M.S., 2017. Predicting non-suicidal self-injury in borderline personality disorder using ecological momentary assessment. J. Pers. Disord. 10, 1–12.

Andover, M.S., Gibb, B.E., 2010. Non-suicidal self-injury, attempted suicide, and suicidal intent among psychiatric inpatients. Psychiatry Res. 178 (1), 101–105.

Andrewes, H.E., Hulbert, C., Cotton, S.M., Betts, J., Chanen, A.M., 2016. Ecological momentary assessment of nonsuicidal self-injury in youth with borderline personality disorder. Personal. Disord. Advance online publication.

Andrewes, H.E., Hulbert, C., Cotton, S.M., Betts, J., Chanen, A.M., 2017. An ecological momentary assessment investigation of complex and conflicting emotions in youth with borderline personality disorder. Psychiatry Res. 252, 102–110.

Anestis, M.D., Silva, C., Lavender, J.M., Crosby, R.D., Wonderlich, S.A., Engel, S.G., et al., 2012. Predicting nonsuicidal self-injury episodes over a discrete period of time in a sample of women diagnosed with bulimia nervosa: an analysis of self-reported trait and ecological momentary assessment based affective lability and previous suicide attempts. Int. J. Eat. Disord. 45 (6), 808–811.

Armey, M.F., 2012. Ecological momentary assessment and intervention in nonsuicidal self-injury: a novel approach to treatment. J. Cogn. Psychother. 26 (4), 299–317.

Armey, M.F., Crowther, J.H., Miller, I.W., 2011. Changes in ecological momentary assessment reported affect associated with episodes of nonsuicidal self-injury. Behav. Ther. 42 (4), 579–588.

Armey, M.F., Nugent, N.R., Crowther, J.H., 2012. An exploratory analysis of situational affect, early life stress, and non-suicidal self-injury in college students. J. Adolesc. Trauma. 5, 327–343.

Armey, M.F., Schatten, H.T., Haradhvala, N., Miller, I.W., 2015. Ecological momentary assessment (EMA) of depression-related phenomena. Curr. Opin. Psychol. 4, 21–25.

Baetens, I., Claes, L., Muehlenkamp, J., Grietens, H., Onghena, P., 2011. Non-Suicidal and suicidal self-injurious behavior among flemish adolescents: a web-survey. Arch. Suicide Res. 15 (1), 56–67.

Barak, A., 2007. Emotional support and suicide prevention through the Internet: a field project report. Comput. Human Behav. 23 (2), 971–984.

Bennett, G.G., Glasgow, R.E., 2009. The delivery of public health interventions via the internet: actualizing their potential. Annu. Rev. Public Health 30 (1), 273–292.

Bentley, K.H., Nock, M.K., Sauer-Zavala, S., Gorman, B.S., Barlow, D.H., 2017. A functional analysis of two transdiagnostic, emotion-focused interventions on nonsuicidal self-injury. J. Consult. Clin. Psychol. 85 (6), 632–646.

Bolger, N., Davis, A., Rafaeli, E., 2003. Diary methods: capturing life as it is lived. Annu. Rev. Psychol. 54, 579–616.

Bresin, K., 2014. Five indices of emotion regulation in participants with a history of nonsuicidal self-injury: a daily diary study. Behav. Ther. 45, 56–66.

Bresin, K., Carter, D.L., Gordon, K.H., 2013. The relationship between trait impulsivity, negative affective states, and urge for nonsuicidal self-injury: a daily diary study. Psychiatry Res. 205, 227–231.

Bunning, K., 1998. To engage or not to engage? Affecting the interactions of learning disabled adults. Int. J. Lang. Commun. Disord. 33 (Suppl), 386–391.

Davidson, C.L., Anestis, M.D., Gutiérrez, P.M., 2017. Ecological momentary assessment is a neglected methodology in suicidology. Arch. Suicide Res. 21 (1), 1–11.

Delespaul, P., 1995. Assessing Schizophrenia in Daily Life: The Experience Sampling Method. Maastricht Univ. Press, Maastrich.

Ellison, W.D., 2014. Using dynamic factor analysis to model intraindividual variation in borderline personality disorder symptoms. Penn State, US.

Evans, K., Tyrer, P., Catalan, J., Schmidt, U., Davidson, K., Dent, J., et al., 1999. Manual-assisted cognitive-behaviour therapy (MACT): a randomized controlled trial of a brief intervention with bibliotherapy in the treatment of recurrent deliberate self-harm. Psychol. Med. 29 (1), 19–25.

Forbush, K.T., Hunt, T.K., 2014. Characterization of eating patterns among individuals with eating disorders: what is the state of the plate? Physiol. Behav. 134, 92–109.

Grandclerc, S., Labrouhe, D.D., Spodenkiewicz, M., Lachal, J., Moro, M.R., 2016. Relations between nonsuicidal self-injury and suicidal behavior in adolescence: a systematic review. PloS ONE 11 (4).

Hamza, C.A., Willoughby, T., 2015. Nonsuicidal self-injury and affect regulation: recent findings from experimental and ecological momentary assessment studies and future directions. J. Clin. Psychol. 71 (6), 561–574.

Hasler, G., Hopwood, C.J., Jacob, G.A., Brändle, L.S., Schulte-Vels, T., 2014. Patient-reported outcomes in borderline personality disorder. Dialog-. Clin. Neurosci. 16 (2), 255–266.

Horowitz, S., Stermac, L., 2017. The relationship between interpersonal trauma history and the functions of non-suicidal self-injury in young adults: an experience sampling study. J. Trauma Dissociation 16, 1–15.

Houben, M., Claes, L., Vansteelandt, K., Berens, A., Sleuwaegen, E., Kuppens, P., 2017. The emotion regulation function of nonsuicidal self-injury: a momentary assessment study in inpatients with borderline personality disorder features. J. Abnorm. Psychol. 126 (1), 89–95.

Humber, N., Emsley, R., Pratt, D., Tarrier, N., 2013. Anger as a predictor of psychological distress and self-harm ideation in inmates: a structured self-assessment diary study. Psychiatry Res. 210 (1).

Intille, S., 2007. Technological innovations enabling automatic, context-sensitive ecological momentary assessment. In: Stone, A. (Ed.), The Science of Real-time Data Capture: Self-reports in Health Research. Oxford University Press, Oxford, pp. 308–337.

Lavender, J.M., De Young, K.P., Wonderlich, S.A., Crosby, R.D., Engel, S.G., Mitchell, J.E., et al., 2013a. Daily patterns of anxiety in anorexia nervosa: associations with eating disorder behaviors in the natural environment. J. Abnorm. Psychol. 122 (3), 672–683.

Lavender, J.M., Wonderlich, S.A., Crosby, R.D., Engel, S.G., Mitchell, J.E., Crow, S.J., et al., 2013b. Personality-based subtypes of anorexia nervosa: examining validity and utility using baseline clinical variables and ecological momentary assessment. Behav. Res. Ther. 51 (8), 512–517.

Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., G Gøtzsche, P.C., Ioannidis, J.P., et al., 2009. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. PLoS Med. 6, 7.

Maas, J., Hietbrink, L., Rinck, M., Keijsers, G.P.J., 2013. Changing automatic behavior through self- monitoring: does overt change also imply implicit change? J. Behav. Ther. Exp. Psychiatry 44, 279–284.

McKenzie, K.C., 2014. Non-suicidal self-injury: an emotion regulation perspective. ProQuest Information & Learning, US.

Meany-Daboul, M.G., Roscoe, E.M., Bourret, J.C., Ahearn, W.H., 2007. A comparison of momentary time sampling and partial-interval recording for evaluating functional relations. J. Appl. Behav. Anal. 40 (3), 501–514.

Muehlenkamp, J., Brausch, A., Quigley, K., Whitlock, J., 2013. Interpersonal features and functions of nonsuicidal self-injury. Suicide Life Threat. Behav. 43 (1), 67–80.

Muehlenkamp, J.J., Engel, S.G., Wadeson, A., Crosby, R.D., Wonderlich, S.A., Simonich, H., et al., 2009. Emotional states preceding and following acts of non-suicidal self-injury in bulimia nervosa patients. Behav. Res. Ther. 47 (1), 83–87.

Myin-Germeys, I., Birchwood, M., Kwapil, T., 2011. From environment to therapy in psychosis: a real-world momentary assessment approach. Schizophr. Bull. 37 (2), 244–247.

Nock, M.K., 2010. Self-injury. Annu. Rev. Clin. Psychol. 6, 339–363.

Nock, M.K., Favazza, A.R., 2009a. Nonsuicidal self-injury: definition and classification. In: Nock, M.K. (Ed.), Understanding Nonsuicidal Self-injury. Origins, Assessment and Treatment. American Psychological Association, Washington, DC, pp. 9–18.

Nock, M.K., Joiner, T.E., Gordon, K.H., Lloyd-Richardson, E., Prinstein, M.J., 2006. Non-suicidal self-injury among adolescents: diagnostic correlates and relation to suicide attempts. Psychiatry Res. 144 (1), 65–72.

Nock, M.K., Prinstein, M.J., Sterba, S.K., 2009b. Revealing the form and function of self-injurious thoughts and behaviors: a real-time ecological assessment study among adolescents and young adults. J. Abnorm. Psychol. 118 (4), 816–827.

Özcan, N.K., Bilgin, H., Akın, M., Badırgalı Boyacıoğlu, N.E., 2015. Nurses' attitudes

towards professional containment methods used in psychiatric wards and perceptions of aggression in Turkey. J. Clin. Nurs. 24 (19–20), 2881–2889.
Pearson, C.M., Pisetsky, E.M., Goldschmidt, A.B., Lavender, J.M., Wonderlich, S.A., Crosby, R.D., et al., 2016. Personality psychopathology differentiates risky behaviors among women with bulimia nervosa. Int. J. Eat. Disord. 49 (7), 681–688.
Putnam, K.M., McSweeney, L.B., 2008. Depressive symptoms and baseline prefrontal EEG alpha activity: a study utilizing ecological momentary assessment. Biol. Psychol. 77 (2), 237–240.
Reis, H.T., Gable, S.L., 2000. Event-sampling and other methods for studying everyday experience. In: Reis, H.T., Judd, C.M. (Eds.), Handbook of Research Methods in Social and Personality Psychology. Cambridge University Press, New York, pp. 190–222.
Santangelo, P.S., Koenig, J., Funke, V., Parzer, P., Resch, F., Ebner-Priemer, U.W., et al., 2016. Ecological momentary assessment of affective and interpersonal instability in adolescent non-suicidal self-injury. J. Abnorm. Child Psychol. 45 (7), 1429–1438.
Shiffman, S., 2009. Ecological momentary assessment (EMA) in studies of substance use. Psychol. Assess. 21 (4), 486–497.
Shiffman, S., 2014. Conceptualizing analyses of ecological momentary assessment data. Nicotine Tob. Res. 16 (Suppl 2), S76–S87.
Shiffman, S., Stone, A.A., Hufford, M.R., 2008. Ecological momentary assessment. Ann. Rev. Clin. Psychol. 4, 1–32.
Shingleton, R.M., Eddy, K.T., Keshaviah, A., Franko, D.L., Swanson, S.A., Yu, J.S., et al., 2013. Binge/purge thoughts in nonsuicidal self-injurious adolescents: an ecological momentary analysis. Int. J. Eat. Disord. 46 (7), 684–689.
Stone, A.A., Shiffman, S.S., DeVries, M.W., 1999. Ecological momentary assessment. In: Kahneman, D., Diener, E., Schwarz, N. (Eds.), Well-being: The Foundations of Hedonic Psychology. Russell Sage Foundation, New York.
Swannell, S.V., Martin, G.E., Page, A., Hasking St, P., John, N.J., 2014. Prevalence of nonsuicidal self-injury in nonclinical samples: systematic review, meta-analysis and meta-regression. Suicide Life Threat. Behav. 44 (3), 273–303.
Turner, B.J., Cobb, R.J., Gratz, K.L., Chapman, A.L., 2016a. The role of interpersonal conflict and perceived social support in nonsuicidal self-injury in daily life. J. Abnorm. Psychol. 125 (4).
Turner, B.J., Yiu, A., Claes, L., Muehlenkamp, J.J., Chapman, A.L., 2016b. Occurrence and co-occurrence of nonsuicidal self-injury and disordered eating in a daily diary study: which behavior, when? Psychiatry Res. 246, 39–47.
Turner, B.J., Wakefield, M.A., Gratz, K.L., Chapman, A.L., 2017. Characterizing interpersonal difficulties among young adults who engage in nonsuicidal self-injury using a daily diary. Behav. Ther. 48 (3), 366–379.
Vansteelandt, K., Houben, M., Claes, L., Berens, A., Sleuwaegen, E., Sienaert, P., et al., 2017. The affect stabilization function of nonsuicidal self-injury in borderline personality disorder: an ecological momentary assessment study. Behav. Res. Ther. 92, 41–50.
Victor, S.E., Klonsky, E.D., 2014. Daily emotion in non-suicidal self-injury. J. Clin. Psychol. 70, 364–375.
Walz, L.C., Nauta, M.H., Aan Het Rot, M., 2014. Experience sampling and ecological momentary assessment for studying the daily lives of patients with anxiety disorders: a systematic review. J. Anxiety Disord. 28 (8), 925–937.
Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Baral Abrams, G., Barreira, P., et al., 2013. Nonsuicidal self-injury as a gateway to suicide in young adults. J. Adolesc. 52 (4), 486–492.
Wright, A.G.C., Hallquist, M.N., Stepp, S.D., Scott, L.N., Beeney, J.E., Lazarus, S.A., et al., 2016. Modeling heterogeneity in momentary interpersonal and affective dynamic processes in borderline personality disorder. Assessment 23 (4), 484–495.
Zaki, L.F., Coifman, K.G., Rafaeli, E., Berenson, K.R., Downey, G., 2013. Emotion differentiation as a protective factor against nonsuicidal self-injury in borderline personality disorder. Behav. Ther. 44, 529–540.

6.3.3. Artículo 3

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ORIGINAL ARTICLE

User profiles of electronic ecological momentary assessment in outpatient child and adolescent mental health services

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KEYWORDS
Ecological momentary assessment;
Self-harm;
Adolescence;
Clinical sample;
User profiles

Abstract
Introduction: Electronic ecological momentary assessment (EMA) can provide precise information regarding day-to-day functioning of patients overcoming some of the limitations of usual clinical evaluation; however adherence to this methodology might be a major threat. Research and application of EMA concerning clinical settings remains scant. Our goal was to study the user profiles of EMA in a clinical sample of adolescents.
Material and methods: 209 adolescents following an outpatient mental health treatment accepted to use EMA. They were evaluated in different sociodemographic and clinical variables as well as the use that they made of EMA.
Results: 39.7% of patients were considered users and 60.3% non-active users. Certain self-harm behaviours were more common in the group of active users, while hyperkinetic disorders were more common in the group of non-active users. A regression analysis revealed that non-suicidal self-injury (OR = 2.99) and hyperkinetic disorders (OR = 0.51) were related to the use of EMA.

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Conclusion: This preliminary study adds novel and promising information about EMA use in clinical practice. Adolescents with self-harm behaviours EMA seem more prone to use this tool. Our study provides support for actively monitoring self-harm behaviours with EMA. Future studies might consider a comprehensive analysis of adherence and EMA data collection.
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PALABRAS CLAVE
Evaluación momentánea ecológica;
Autolesión;
Adolescencia;
Muestra clínica;
Perfil de usuario

Perfil de usuarios de evaluación momentánea ecológica en una muestra de adolescentes en seguimiento en un centro de salud mental

Resumen
Introducción: La evaluación momentánea ecológica (EME) electrónica puede proporcionar información precisa con respecto al funcionamiento cotidiano de los pacientes, superando algunas de las limitaciones de la evaluación en la clínica habitual. Sin embargo, la adherencia de los pacientes a esta metodología puede ser complicada. La investigación y aplicación de la EME en entornos clínicos sigue siendo escasa. Nuestro objetivo fue estudiar los perfiles de usuario de la EME en una muestra clínica de adolescentes.
Material y métodos: Doscientos nueve adolescentes en seguimiento en un centro ambulatorio de salud mental aceptaron usar la EME. Se evaluaron diferentes variables sociodemográficas y clínicas de los pacientes, además del uso que hicieron de la herramienta.
Resultados: El 39,7% de los pacientes fueron consideraron usuarios y el 60,3% usuarios no activos. Ciertas conductas autolesivas fueron más comunes en el grupo de usuarios activos, mientras que los trastornos hipercinéticos fueron más comunes en el grupo de usuarios no activos. Un análisis de regresión reveló que las autolesiones no suicidas (OR: 2,99) y los trastornos hipercinéticos (OR: 0,51) estaban relacionados con el uso de la EME.
Conclusión: Este estudio preliminar añade información novedosa y prometedora sobre el uso de la EME en la práctica clínica. Los adolescentes con conducta autolesiva parecen ser más propensos al uso de esta herramienta lo que refuerza la idea de utilizar la EME de forma activa para monitorear esta conducta. En futuros estudios se considerará el análisis exhaustivo de la adherencia y la recopilación de datos de la EME.
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Introduction

Ecological momentary assessment (EMA) is an evaluation method that consists in the collection of certain behaviours, symptoms, and states of the subject in real-time (or shortly after) and in their day-to-day life. This method can help us to better understand and even predict certain behaviours overcoming some of the limitations of usual clinical evaluation in which time with subjects is limited and the information is generally collected retrospectively.[1]

EMA is not a single method, much less a particular technology, but a collection of methods that share the aforementioned characteristics.[1] Assessment scheduling in EMA can vary based on the study aim. So-called 'event-contingent' assessments are linked to events, such as occasions when the subject is about to undertake or has just undertaken a particular behaviour.[2] Another approach to EMA is to schedule assessments for certain times, which is known as 'time-based assessments'.[2]

Methods of assessment can range from the use of paper and pencil to the use of the most advanced technologies. The use of new technologies such as web-based methodology is replacing conventional methods (paper version).[3] This implies a greater precision and realism of data since they permit the verification of the time of entry, which implies a more detailed analysis of compliance.

Compliance seems to be better when using new technologies[1,4,5] and preference for electronic versus more traditional paper diaries has been found even in older subjects.[6] Electronic EMA has been successfully applied in different populations such us low socioeconomic status patients[7] and subjects with psychiatric disorders such as psychosis,[8,9] affective disorders,[10,11] substance use disorders[1,12] or self-injurer populations[13] among others. However, subject self-reports required from some EMA and the rejection towards new technologies of some subjects are major threats to electronic EMA adherence.

Adolescents might be considered a target population for electronic EMA since they are very prone to use new technologies such as mobile phone applications although there is still scant literature regarding adherence to EMA on this population. Electronic EMA seems a powerful tool to use with subjects who engage in risky behaviours that start during adolescence and that are frequent in clinical population such as self-harm behaviours.[14] These behaviours are not always reported during face-to-face consultation. However, evidence suggests that self-harming youth make more use of new technologies (social networks) and that

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they are utilized as a medium to communicate with and to seek social support from others.[15]

A recent review about compliance with mobile EMA protocols in children and adolescents found an average compliance rate of 78%, not finding differences between clinical and non-clinical samples.[16] The average compliance in this review is defined as suboptimal and it is under adult's compliance found in other review studies, which is over 80%.[17,18] In their review[16] they included 42 studies but only four studies were carried out on mental health samples. The aim of the study was the examination of the relationship between adolescent compliance and study design factors such as length of EMA protocols and sampling frequency. Some of the studies also took into account the influence of some personal variables such as age[19–23] gender,[19–25] disease status[19-24] or intelligence quotient (IQ).[23] From these variables only IQ was positively associated with compliance.[23]

Apart from analyzing EMA design factors related to adherence to this methodology, it is also important to specifically examine which personal factors are related to the usage of electronic EMA assessment. Barrigon et al.,[26] carried out a study concerning this issue in adult clinical population finding that active users were younger and more frequently diagnosed with anxiety related disorders than non-active users. They were more likely to report thoughts about death and suicide and had experienced more stressful life events than non-active users. Rickwood et al.,[27] tried to provide a comprehensive profile of young people seeking web-based mental health support instead of face-to-face. They found that more web-based mental health support users were female and they tended to be older. They also found that a higher percentage of web-based support users presented high or very high levels of psychological distress, but they were at an earlier stage of illness on other indicators of clinical presentation compared with centre-based counselling clients.

Although EMA has gained broad acceptability in research in the last years, there is little knowledge concerning clinical practice and user profiles. To the best of our knowledge the study of Barrigon et al.,[26] is the only one that specifically studies this issue, and there are not studies regarding this issue in clinical adolescent population. Examining clinical and demographic profiles of adolescents who will and won't respond to EMA would add knowledge to the present literature. Additionally, it might help in research and clinical practice with adolescents since it would allow us to apply EMA in a more targeted and efficient way. It would have important benefits in clinical practice, in which time with patients is limited. Regarding clinical characteristics we hypothesize that patients diagnosed with hyperkinetic disorders (International Classification of Diseases, 10th revision – ICD-10) might be less inclined to use EMA since the avoidance of mental effort and the emotional dysregulation typical of these disorders might interfere the use of EMA.[28] Given that adult active users were more likely to report thoughts about death and suicide than non-active users in a clinical sample[26] and concerning the study about the frequent use of new technologies in self-harming youth,[15] we hypothesize that adolescents reporting self-harm ideas or behaviours, including NSSI, will be more active in the use of EMA.

As we mentioned before, adolescents might be a target population for EMA use; however, it is important to describe how it can be tailored to characteristics of the patient and applied efficiently. The aim of this study is to determine the sociodemographic and clinical differences between users and non-active users of a new electronic EMA tool in a sample of adolescents followed in outpatient mental health services.

Material and methods

Participants

Subjects were recruited from the Child and Adolescent Outpatient Psychiatric Services of Jiménez Díaz Foundation and Infanta Elena University Hospitals (Madrid, Spain) from November 1st 2015 to October 31st 2018. The sample of patients who were offered the use of EMA was consecutive. After describing the study, written informed consent was obtained from patients and parents or legally authorized representatives who agreed to participate. Subjects under 12 years old, subjects over 18 years old, and/or those who lacked the capacity to comprehend the questionnaires used in this study were excluded. The Jiménez Díaz Foundation Ethics Committee approved the study.

Instruments and procedure

Questionnaires and other clinical information were registered using ''MeMind'' (www.memind.net) a web application that was developed to merge different data sources, including patient and caregiver inputs. The MeMind application had two interfaces, one for clinicians: the ''electronic health record (EHR) view'' and another for patients: the ''EMA view''. The EMA view was also available as a mobile phone application (MeMind).

Clinicians made a first evaluation collecting the following information in the EHR: sociodemographic data, stressful life events and psychosocial problems, ICD-10 mental disorder diagnoses,[29] illness severity measured by the Clinical Global Impression scale – CGI[30] and the Children's Global Assessment Scale –CGAS,[31] and questions regarding any lifetime self-harm thoughts or behaviours: NSSI, thoughts about suicide, suicide plans and suicide attempts.

After the clinician's part was filled out, EMA view for patients was activated. Patients were given a user number and a password in order to access MeMind. They had to complete the following questionnaires the day in which EMA was first activated: the 5-item World Health Organization Well-Being Index (WHO-5)[32] as a measure of subjective psychological well-being, General Health Questionnaire (GHQ-12)[33] as a measure of mental health, and a Visual Analogue Scale (VAS) as a measure of satisfaction with different life areas. The electronic versions used for WHO-5 and GHQ-12 have been considered equivalent to the paper-and-pencil version.[34]

Subsequently, patients had to connect to the EMA interface once a day (at the end of the day). No reminder (e.g. e-mail, sms or pop-ups) was made in this first step of MeMind development. In this ''diary EMA'' patients answered the WHO-5 and the five VAS questions regarding satisfaction with oneself, family, friends, studies and leisure, during the day. Additionally, they had a free-text area (''notes'') that they

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Table 1 Users access to EMA.

	M	*SD*	Minimum	Maximum
Number of entries	10.52	16	1	111
Total tracking time	42.4	53.9	0	239
Tracking frequency	5	9.6	0	81

Note. Number of entries (number of times a patient enters EMA). Total tracking time (days from the EMA activation until the last entry). Tracking frequency (patients make an entry every ''X'' days).

could use at any moment when engaging in their daily life activities.

Patients did not receive any economic incentive for participation and circumstances and setting of the study were very similar to real world conditions.

Statistical analysis

For analysis purposes, subjects were divided into two groups: users (patients who accessed the ''diary EMA'' at least once) and non-active users (patients who never accessed the ''diary EMA'').

According to Barrigón et al.[26] the group was divided based on just one access to the diary EMA since one of our first purposes was to identify the patients that showed initial interest to EMA and were more prone to use the tool. Although considering these criteria we cannot strictly speak of ''adherence'', the adherent group would be considered the users group and the non-adherent group would be considered the non-active users group. The type of adherence (bigger, smaller, partial) was not assessed in this preliminary study.

Univariate analyses using chi-square and *t*-test were performed to compare characteristics between the two groups. The variables analyzed were: sociodemographic (age, sex, ethnicity, academic performance, separation of parents or divorce) and clinical (diagnosis, self-harm behaviour, substance use, stressful life events, illness severity, general mental health index, subjective psychological well-being, and satisfaction with different life areas).

Subsequently, a regression analysis was carried out to establish the magnitude of the association between characteristics of patients that were different between groups and the use of EMA.

Results

There were 209 patients that accepted participation in the study. From them, 83 (39.7%) accessed the diary EMA interface (users), while 126 (60.3%) did not access the diary EMA (non-active users). Information regarding EMA users access is in Table 1.

Univariate analysis

Sociodemographic characteristics of the sample

Participants were (53.6%) women and (46.4%) men, with a mean age of 15 years old ($SD = 1.7$). Most subjects were Spanish (81.8%) and lived with both parents (73.2%). 46.3% of participants had repeated a grade at least once. There were no differences between users and non-active users in these sociodemographic characteristics (Table 2).

Clinical characteristics of the sample

Table 3 summarizes the clinical characteristics of the total sample and compares users and non-active users.

Most patients were diagnosed with hyperkinetic disorders (F90 ICD-10) (61.6%). There were more patients diagnosed with this diagnosis in the group of non-active users (68.9%) than in the group of users (51.4%) ($\chi^2 = 5.626$, $p = .018$). Anxiety related disorders (F4 ICD-10) (22.6%) and affective disorders (F3 ICD-10) (22%) were also frequent. There were more patients diagnosed with anxiety related disorders in the group of users (27%) than in the group of non-active users (19.4%), however this difference was not statistically significant. According to affective disorders, the percentage of patients in each group was very similar, finding no statistically significant differences between groups.

Table 2 Sociodemographic characteristics of the sample.

Sociodemographic characteristics	Total $N = 209$	Users $N = 83$	Non-active users $N = 126$	t/x^2	Df	*p* value
Sex (% females)	53.6% (112)	60.2% (50)	49.2% (62)	2.450	1	.118
Age ($M \pm SD$)	15.2 (±1.7)	15.1 (±1.8)	15.4 (±1.6)	−1.296	207	.196
Country of origin (% Spanish)	81.8% (171)	81.9% (68)	81.7% (103)	0.001	1	.973
Living with (% both parents)	73.2% (153)	68. 7% (57)	76. 2% (96)	1.441	1	.230
Repeated a grade (% repeated at least once)	46.3% (93/201)	43.2% (35/201)	48.3% (58/201)	0.511	1	.475

Note. *p* values significant at the $p < .05$ level (bilateral).

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Table 3 Clinical characteristics of the sample.

Clinical characteristics	Total $N = 209$	Users $N = 83$	Non-active users $N = 126$	t/x^2	df	p value
Hyperkinetic disorders	61.6% (109)	51.4% (38)	68.9% (71)	5.626	1	.018*
Anxiety disorders	22.6% (40)	27% (20)	19.4% (20)	1.426	1	.232
Affective disorders	22% (39)	23% (17)	21.4% (22)	0.065	1	.798
Lifetime NSSI	14.8% (31)	24.1% (20)	8. 7% (11)	9.353	1	.002**
Lifetime suicidal ideation	5.7% (12)	8.4% (7)	4% (5)	1.844	1	.175
Lifetime suicidal planification	3.3% (7)	6% (5)	1.6% (2)	3.043	1	.081
Lifetime suicidal attempt	11.5% (24)	16.9% (14)	7.9% (10)	3.927	1	.048*
Substance use	6.7% (14)	6.3% (8)	7.2% (6)	0.062	1	.803
Bullying	24.4% (51)	27.7% (23)	22. 2% (28)	0.817	1	.366
Sexual abuse	2. 9% (6)	3. 6% (3)	2. 4% (3)	0.273	1	.601
Physical abuse	3.3% (7)	3. 2% (4)	3. 6% (3)	0.030	1	.863
CGI ($M \pm SD$)	3.46 (0.8)	3.57 (0.7)	3.40 (0.82)	−1.497	190	.136
CGAS ($M \pm SD$)	7.5 (1.1)	7.42 (1.1)	7.49 (1.1)	0.425	189	.671
WHO-5 ($M \pm SD$)	220.9 (68.9)	238.3 (87.4)	203. 5 (45.6)	−0.866	10	.407
GHQ-12 ($M \pm SD$)	2.7 (3.2)	2.4 (3.1)	2.8 (3.3)	0.729	160	.467
VAS oneself ($M \pm SD$)	67.84 (25.09)	69.22 (24.61)	69.22 (24.61)	0.827	175	.409
VAS family ($M \pm SD$)	72.22 (26.19)	70.63 (27.05)	73.48 (25.54)	0.721	177	.472
VAS friends ($M \pm SD$)	77.60 (23.13)	76.71 (24.45)	78. 30 (22.10)	0.456	177	.649
VAS studies ($M \pm SD$)	54.06 (26.88)	53.81 (28.03)	54. 25 (26.08)	0.109	175	.913
VAS leisure ($M \pm SD$)	71.10 (29.45)	68.59 (30.47)	73.09 (28.62)	1.012	176	.313

CGI: Clinical Global Impression scale. Scores range from 1 (*not ill*) to 7 (*extremely ill*). CGAS: Children's Global Assessment Scale. Scores range from 1 (constant need for supervision) to 10 (optimal functioning). WHO-5: World Health Organization Well-Being Index. Scores range from 0 (*lower well-being*) to 500 (*greater well-being*). GHQ-12: General Health Questionnaire. Scores range from 0 (*absence of psychological disturbance*) to 12 (*severe psychological disturbance*). VAS: Visual Analogue Scale. Scores range from 0 (*lower satisfaction*) to 100 (*greater satisfaction*).
* $p < .05$.
** $p < .01$.

Regarding self-harm behaviour, there were differences between groups in some specific areas. Users were more likely to report NSSI across lifetime (24.1% of active users) ($\chi^2 = 9.353$, $p = .002$) and suicidal attempts were also more frequent in the group of users (up to 16.9% of users reported lifetime suicidal attempts) ($\chi^2 = 3.927$, $p = 0.048$). Although lifetime suicidal ideation and suicidal planification were more common in the group of users, these differences were not statistically significant.

Concerning other clinical measures such as substance use, stressful life events, illness severity, general mental health index, subjective psychological well-being and satisfaction with different life areas differences were not found.

Regression model

We performed binary logistic regression analyses with all the significant variables as predictors of the EMA user profile. The variables that remained in the model were: ''NSSI across lifetime'' and ''hyperkinetic disorders''. These results suggest a statistically significant relationship between these variables and being an EMA user profile. Patients with ''NSSI across lifetime'' were more prone to be active users, while patients diagnosed with ''hyperkinetic disorders'' were more prone to be non-active users. ''Lifetime suicidal attempts'' was removed from the model in the regression analysis (Table 4).

Table 4 Summary of logistic regression analyses for variables predicting use of EMA.

Step	Predictor	B	$SE\ B$	OR (95% CI)
1	Lifetime NSSI	1.06*	0.49	2.89 (1.11–7.51)
	Hyperkinetic disorders	−0.66*	0.32	0.52 (0.27–0.98)
	Lifetime suicidal attempts	0.143	0.57	1.15 (0.38–3.52)
	Constant	−0.09	0.27	0.91
2	Lifetime NSSI	1.09*	0.47	2.99 (1.19–7.52)
	Hyperkinetic disorders	−0.67*	0.32	0.51(0.27–0.96)
	Constant	−0.76	0.26	0.93

OR: odds ratio.
* $p < .05$.

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Discussion

In our study, 39.7% of the samples were considered users. This figure is above that found in the similar study carried out in adult clinical population (20.5%).[26] The difference between figures is in line with studies showing a better acceptance of internet-based interventions among younger people.[26,35]

Our findings indicate that NSSI and suicidal attempts were significantly more common in the group of users, while hyperkinetic disorders were more common in the group of non-active users. Univariate analyses confirmed this relationship; however, the logistic regression analysis did not confirm it in the case of suicidal attempts, that did not predict EMA use by its own.

According to our hypothesis we found that the patients diagnosed with hyperkinetic disorders were less prone to use EMA. However, a recent systematic review concerning the use of EMA in ADHD concluded that EMA could be successfully implemented with patients diagnosed with ADHD.[36] The majority of the studies were carried out in samples of children up to 12 years old and/or their parents, and they indicate that parent involvement may be critical to maintaining child adherence rates. Only one study was conducted in an adolescent sample.[37] In this four-day study the decliners of the study received more deviant parent ADHD ratings than did the participants, although the final adherence of the non-decliner group was high (80%). The use of EMA in adolescent population diagnosed with ''hyperkinetic disorders'' seems more complex but not useless. Appropriate adaptations such as parent involvement,[36,38] shorter periods of assessment,[37] the use of implicit models of EMA,[39] or more general facilitators such as training of participants and compliance monitoring/check-ins combined with compliance-based incentives [40] might improve the usage in this population.

A positive relationship between self-harm behaviours and the use of EMA was found, which is connected to previous reports. Barrigón et al.,[26] found that patients with suicidal thoughts and plans were more likely to be EMA active users in adult population. In our study we found that different self-harm behaviours (NSSI, suicidal ideation, suicidal planification and suicidal attempt) were more common in the group of users, although only NSSI predicted being a user. Fortunately our sample size of adolescents with lifetime suicidal ideation (5.7%) and lifetime suicidal planification (3.3%) was small. On the other hand, NSSI in adolescence is a common behaviour, indicating prevalence around 21.7% in outpatient clinical samples[14] (15% in our sample). The relationship between NSSI and suicide is not clear but it has been hypothesized that NSSI is a gateway facilitating adolescents to attempt suicide.[41] Both behaviours frequently coexist[42] and NSSI seems to be an important risk factor for suicide after adjusting for other risk factors.[43] All this might be in relation to the fact that only these two self-harm behaviours (lifetime NSSI and lifetime suicidal attempts) were related to the use of EMA in our study, however we can't draw conclusions regarding this issue, since the frequency of self-harm behaviours was low and it goes beyond the scope of this work. It is also curious that there were more lifetime suicide attempters (11.5%) than lifetime suicide ideators or planificators in our sample. Impulsivity is a core characteristic of adolescence, which might explain the impulsive nature of suicidal attempts during this period. Moreover, information regarding suicidal ideation or planification is easier to omit (less evident) than past suicidal attempts.

There are different factors that might be related to the association between self-harm behaviour and EMA use. As it was mentioned before[15] self-harming youth make more use of new technologies in order to communicate to others. Additionally, Rickwood et al.,[27] found that a higher percentage of young web-based support users presented high or very high levels of psychological distress but they were at an earlier stage of illness. Adolescents with NSSI are supposed to suffer from high levels of psychological distress and they might be – according to the aforementioned theories regarding NSSI as a gateway to suicide[41] – in an ''early'' stage of illness. Alternative explanations might be related to the fact that caregiver involvement and monitoring could be higher in patients that have a history of self-harm behaviour.

This preliminary study adds novel and promising information about EMA use in clinical practice. In our sample, adolescents with self-harm behaviours were more active in the use of EMA tool than other adolescents, which provide support for the use of EMA in this population.

A recent paper concerning the current challenges in research on suicide advocates the use of EMA.[44] It might be very useful since accurate monitoring of NSSI with EMA could help with identifying the events recorded in the NSSI population that could predict NSSI and/or suicidal attempts during follow-up.

Our study has some limitations. Given that the use of the tool ''MEmind'' in the clinical setting is relatively time consuming for clinicians, optimal data collection was at times complicated. The sample size was small and diagnosis variability was limited also. We should acknowledge that certain behaviours had a low frequency – such us some self-harm behaviours –; hence we must be cautious when drawing conclusions and take these results as provisional.

The fact that we used a naturalistic clinical adolescent sample also limits the generalization of our results, however this makes the results ecological and adapted to the real clinical setting. In relation to the EMA interface for adolescents it still has some limitations such as lack of pop-ups or reminders, which make adherence more complicated. The fact that patients did not have any direct incentive for completing EMA also makes adherence more complicated.

Conclusions

Nevertheless, to the best of our knowledge, this is the first study that specifically examines the personal variables that are in relation to EMA use in adolescents assisted in outpatient mental health services. This study has important research and clinical implications since it provides clues as to the application of EMA in varying clinical subpopulations.

Future studies might consider the inclusion of bigger samples and the examination of potential differences between high frequency and low frequency users, as well as EMA tool improvements.

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Conflict of interests

None declared.

References

1. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. Annu Rev Clin Psychol. 2008;4:1–32.
2. Reis HT, Gable SL. Event-sampling and other methods for studying everyday experience. In: Handbook of research methods in social and personality psychology. New York, NY, US: Cambridge University Press; 2000. p. 190–222.
3. Hektner J, Schmidt J, Csikszentmihalyi M. Experience sampling method: measuring the quality of everyday life. Thousand Oaks: SAGE Publications; 2006.
4. Hufford MR, Shields AL, Shiffman S, Paty J, Balabanis M. Reactivity to ecological momentary assessment: an example using undergraduate problem drinkers. Psychol Addict Behav. 2002;16:205–11.
5. Stone AA, Shiffman S, Schwartz JE, Broderick JE, Hufford MR. Patient compliance with paper and electronic diaries. Control Clin Trials. 2003;24:182–99.
6. Shiffman S. Designing protocols for ecological momentary assessment. In: Stone AA, Shiffman S, Atienza A, Nebeling A, editors. The science of real-time data capture: self-reports in health research. New York: Oxford University Press; 2007. p. 27–53.
7. Finkelstein J, Cabrera MR, Hripcsak G. Internet-based home asthma telemonitoring: can patients handle the technology? Chest. 2000;117:148–55.
8. Myin-Germeys I, Birchwood M, Kwapil T. From environment to therapy in psychosis: a real-world momentary assessment approach. Schizophr Bull. 2011;37:244–7.
9. Swendsen J, Ben-Zeev D, Granholm E. Real-time electronic ambulatory monitoring of substance use and symptom expression in schizophrenia. Am J Psychiatry. 2011;168:202–9.
10. Peeters F, Berkhof J, Delespaul P, Rottenberg J, Nicolson NA. Diurnal mood variation in major depressive disorder. Emotion. 2006;6:383–91.
11. Putnam KM, McSweeney LB. Depressive symptoms and baseline prefrontal EEG alpha activity: a study utilizing Ecological Momentary Assessment. Biol Psychol. 2008;77:237–40.
12. Shiffman S. Conceptualizing analyses of ecological momentary assessment data. Nicotine Tobacco Res. 2014;16 Suppl. 2:S76–87.
13. Rodríguez-Blanco L, Carballo JJ, Baca-García E. Use of ecological momentary assessment (EMA) in non-suicidal self-injury (NSSI): a systematic review. Psychiatry Res. 2018;263:212–9.
14. Díaz de Neira M, García-Nieto R, de León-Martinez V, Pérez Fominaya M, Baca-García E, Carballo JJ. Prevalencia y funciones de los pensamientos y conductas autoagresivas en una muestra de adolescentes evaluados en consultas externas de salud mental. Rev Psiquiatr Salud Ment. 2015;8:137–45.
15. Memon AM, Sharma SG, Mohite SS, Jain S. The role of online social networking on deliberate self-harm and suicidality in adolescents: a systematized review of literature. Indian J Psychiatry. 2018;60:384–92.
16. Wen CKF, Schneider S, Stone AA, Spruijt-Metz D. Compliance with mobile ecological momentary assessment protocols in children and adolescents: a systematic review and meta-analysis. J Med Internet Res. 2017;19:e132.
17. Cain AE, Depp CA, Jeste DV. Ecological momentary assessment in aging research: a critical review. J Psychiatr Res. 2009;43:987–96.
18. Morren M, van Dulmen S, Ouwerkerk J, Bensing J. Compliance with momentary pain measurement using electronic diaries: a systematic review. Eur J Pain. 2009;13:354–65.
19. Borus JS, Blood E, Volkening LK, Laffel L, Shrier LA. Momentary assessment of social context and glucose monitoring adherence in adolescents with type 1 diabetes. J Adolesc Health. 2013;52:578–83.
20. Connelly M, Bromberg MH, Anthony KK, Gil KM, Franks L, Schanberg LE. Emotion regulation predicts pain and functioning in children with juvenile idiopathic arthritis: an electronic diary study. J Pediatr Psychol. 2012;37:43–52.
21. Connelly M, Miller T, Gerry G, Bickel J. Electronic momentary assessment of weather changes as a trigger of headaches in children. Headache. 2010;50:779–89.
22. Dunton G, Dzubur E, Li M, Huh J, Intille S, McConnell R. Momentary assessment of psychosocial stressors, context, and asthma symptoms in hispanic adolescents. Behav Modif. 2016;40:257–80.
23. Khor AS, Gray KM, Reid SC, Melvin GA. Feasibility and validity of ecological momentary assessment in adolescents with high-functioning autism and Asperger's disorder. J Adolesc. 2014;37:37–46.
24. Bromberg MH, Connelly M, Anthony KK, Gil KM, Schanberg LE. Self-reported pain and disease symptoms persist in juvenile idiopathic arthritis despite treatment advances: an electronic diary study. Arthritis Rheumatol. 2014;66:462–9.
25. Stinson JN, Jibb LA, Nguyen C, Nathan PC, Maloney AM, Dupuis LL, et al. Development and testing of a multidimensional iPhone pain assessment application for adolescents with cancer. J Med Internet Res. 2013;15:e51.
26. Barrigón ML, Berrouiguet S, Carballo JJ, Bonal-Giménez C, Fernández-Navarro P, Pfang B, et al. User profiles of an electronic mental health tool for ecological momentary assessment: MEmind. Int J Methods Psychiatr Res. 2017;26.
27. Rickwood D, Webb M, Kennedy V, Telford N. Who are the young people choosing web-based mental health support? Findings from the implementation of Australia's National Web-based Youth Mental Health Service, eheadspace. JMIR Mental Health. 2016;3:e40.
28. Rosen PJ, Epstein JN, Van Orden G. I know it when I quantify it: ecological momentary assessment and recurrence quantification analysis of emotion dysregulation in children with ADHD. Atten Defic Hyperact Disord. 2013;5:283–94.
29. World Health Organization (WHO). Tenth Revision of the International Classification of Diseases and Related Health Problems (ICD-10). Geneva: WHO; 1992.
30. Guy W. ECDEU Assessment Manual for Psychopharmacology. Rockville, MD: US Department of Heath, Education, and Welfare Public Health Service Alcohol, Drug Abuse, and Mental Health Administration; 1976.
31. Shaffer D, Gould MS, Brasic J, Ambrosini P, Fisher P, Bird H, et al. A children's global assessment scale (CGAS). Arch Gen Psychiatry. 1983;40:1228–31.

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32. World Health Organization. The WHO-5 website https://www.psykiatri-regionh.dk/who-5/Documents/WHO5_English.pdf [Retrieved 29.08.15].
33. Sánchez-López M, del P, Dresch V. The 12-Item General Health Questionnaire (GHQ-12): reliability, external validity and factor structure in the Spanish population. Psicothema. 2008;20:839–43.
34. Barrigón ML, Rico-Romano AM, Ruiz-Gómez M, Delgado-Gómez D, Barahona I, Aroca F, et al. Estudio comparativo de los formatos en lápiz y papel y electrónicos de los cuestionarios GHQ-12, WHO-5 y PHQ-9. Rev Psiquiatr Salud Ment. 2017.
35. Lal S, Adair CE. E-mental health: a rapid review of the literature. Psychiatric Services. 2014;65:24–32.
36. Miguelez-Fernandez C, de Leon SJ, Baltasar-Tello I, Peñuelas-Calvo I, Barrigon ML, Capdevila AS, et al. Evaluating attention-deficit/hyperactivity disorder using ecological momentary assessment: a systematic review. Atten Defic Hyperact Disord. 2018;10:247–65.
37. Whalen CK, Jamner LD, Henker B, Delfino RJ, Lozano JM. The ADHD spectrum and everyday life: experience sampling of adolescent moods, activities, smoking, and drinking. Child Dev. 2002;73:209–27.
38. O'Connor SG, Koprowski C, Dzubur E, Leventhal AM, Huh J, Dunton GF. Differences in mothers' and children's dietary intake during physical and sedentary activities: an ecological momentary assessment study. J Acad Nutr Diet. 2017;117:1265–71.
39. Berrouiguet S, Ramírez D, Barrigón ML, Moreno-Muñoz P, Carmona Camacho R, Baca-García E, et al. Combining continuous smartphone native sensors data capture and unsupervised data mining techniques for behavioral changes detection: a case series of the Evidence-Based Behavior (eB2) study. JMIR Mhealth Uhealth. 2018;6:e197.
40. Heron KE, Everhart RS, McHale SM, Smyth JM. Using mobile-technology-based ecological momentary assessment (EMA) methods with youth: a systematic review and recommendations. J Pediatr Psychol. 2017;42:1087–107.
41. Grandclerc S, Labrouhe DD, Spodenkiewicz M, Lachal J, Moro M-R. Relations between nonsuicidal self-injury and suicidal behavior in adolescence: a systematic review. PLOS ONE. 2016;11, e0153760.
42. Nock MK, Joiner TE, Gordon KH, Lloyd-Richardson E, Prinstein MJ. Non-suicidal self-injury among adolescents: diagnostic correlates and relation to suicide attempts. Psychiatry Res. 2006;144:65–72.
43. Andover MS, Gibb BE. Non-suicidal self-injury, attempted suicide, and suicidal intent among psychiatric inpatients. Psychiatry Res. 2010;178:101–5.
44. Barrigón ML, Baca-García E. Current challenges in research in suicide. Rev Psiquiatr Salud Ment. 2018;11:1–3.

Please cite this article in press as: Rodríguez-Blanco L, et al. User profiles of electronic ecological momentary assessment in outpatient child and adolescent mental health services. Rev Psiquiatr Salud Ment (Barc.). 2020. https://doi.org/10.1016/j.rpsm.2020.04.001

7. REFERENCIAS

Adrian, M., Zeman, J., Erdley, C., Whitlock, K. y Sim L. (2019). Trajectories of non-suicidal self-injury in adolescent girls following inpatient hospitalization. *Clinical Child Psychology and Psychiatry*, 24 (4), 831-846

Aglan, A., Kerfoot, M. y Pickles, A. (2008). Pathways from adolescent deliberate self-poisoning to early adult outcomes: a six-year follow- up. *Journal of Child Psychology and Psychiatry*, 49(5), 508-515.

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders*, (Fifth Edition). Washington, DC: American Psychiatric Publishing.

Ammerman, B. A., Olino, T. M., Coccaro, E. F. y McCloskey, M. S. (2017). Predicting Nonsuicidal Self-Injury in Borderline Personality Disorder Using Ecological Momentary Assessment. *Journal of Personality Disorders*, 10, 1-12.

Andover, M. S. y Gibb, B. E. (2010). Non-suicidal self-injury, attempted suicide, and suicidal intent among psychiatric inpatients. *Psychiatry Research*, 178(1), 101-105.

Andrewes, H. E., Hulbert, C., Cotton, S. M., Betts, J. y Chanen, A. M. (2016). Ecological Momentary Assessment of Nonsuicidal Self-Injury in Youth With Borderline Personality Disorder. *Personality Disorders: Theory, Research, and Treatment*. Advance online publication

Andrewes, H. E., Hulbert, C., Cotton, S. M., Betts, J. y Chanen, A. M. (2017). An ecological momentary assessment investigation of complex and conflicting

emotions in youth with borderline personality disorder. *Psychiatry Research,* 252, 102–110.

Anestis, M. D., Silva, C., Lavender, J. M., Crosby, R. D., Wonderlich, S. A., Engel, S. G. y Joiner, T. E. (2012). Predicting nonsuicidal self-injury episodes over a discrete period of time in a sample of women diagnosed with bulimia nervosa: An analysis of self-reported trait and ecological momentary assessment based affective lability and previous suicide attempts. *International Journal of Eating Disorders*, 45(6), 808-811.

Armey, M.F. (2012). Ecological momentary assessment and intervention in nonsuicidal self-injury: a novel approach to treatment. *Journal of Cognitive Psychotherapy*, 26 (4), 299–317.

Armey, M. F., Crowther, J. H. y Miller, I. W. (2011). Changes in ecological momentary assessment reported affect associated with episodes of nonsuicidal self-injury. *Behavior Therapy*, 42(4), 579–588.

Armey, M. F., Nugent, N. R. y Crowther, J. H. (2012). An exploratory analysis of situational affect, early life stress, and non-suicidal self-injury in college students. *Journal of Child and Adolescent Trauma,* 5, 327-343.

Baetens, I., Claes, L., Muehlenkamp, J., Grietens, H. y Onghena, P. (2011). Non-Suicidal and Suicidal Self-Injurious Behavior among Flemish Adolescents: A Web-Survey. *Archives of Suicide Research,* 15(1), 56–67.

Barak, A. (2007). Emotional support and suicide prevention through the Internet: a field project report. *Computers in Human Behavior*, 23 (2), 971-984

Barrigón, M.L y Baca-García, E. y Artés-Rodríguez, A. (2018). Current challenges in research in suicide. *Revista de Psiquiatría y Salud Mental.* 11 (1), 1-3

Barrigón, M. L., Berrouiguet, S., Carballo, J. J., Bonal-Giménez, C., Fernández-Navarro, P., Pfang, B., Delgado-Gómez, D., Courtet, P., Aroca, F., Lopez-Castroman, J., Artés-Rodríguez, A., Baca-García, E. y MEmind study group. (2017a). User profiles of an electronic mental health tool for ecological momentary assessment: MEmind. *International Journal of Methods in Psychiatric Research*, 26 (1).

Barrigón, M. L., Rico-Romano, A. M., Ruiz-Gomez, M., Delgado-Gomez, D., Barahona, I., Aroca, F., Baca-García, E. y MEmind Study Group. (2017b). Comparative study of pencil-and-paper and electronic formats of GHQ-12, WHO-5 and PHQ-9 questionnaires. *Revista de Psiquiatria y Salud Mental*, 1

Bellón , J. A., Delgado, A., Luna J. D. y Lardelli Claret, P. (1996). Validez y fiabilidad del cuestionario de función familiar Apgar-familiar. *Atención Primaria*, 18(6), 289-296.

Bennett, J. K., Fuertes, J. N., Keitel, M. y Phillips, R. (2011). The role of patient attachment and working alliance on patient adherence, satisfaction, and health-related quality of life in lupus treatment. *Patient Education and Counseling*, 85(1), 53–59.

Bentley, K. H., Nock, M. K., Sauer-Zavala, S., Gorman, B. S. y Barlow, D. H. (2017). A functional analysis of two transdiagnostic, emotion-focused interventions on nonsuicidal self-injury. *Journal of Consulting and Clinical Psychology*, 85(6), 632-646.

Berrouiguet, S., Ramírez, D., Barrigón, M. L., Moreno-Muñoz, P., Carmona Camacho, R., Baca-García, E. y Artés-Rodríguez, A. (2018). Combining Continuous Smartphone Native Sensors Data Capture and Unsupervised Data Mining Techniques for Behavioral Changes Detection: A Case Series of the Evidence-Based Behavior (eB2) Study. *JMIR mHealth and uHealth,* 6(12), e197. 2

Bolger, N., Davis, A. y Rafaeli, E. (2003). Diary methods: capturing life as it is lived. *Annual Review of Psychology*, *54*, 579-616.

Borus, J. S., Blood, E., Volkening, L. K., Laffel, L. y Shrier, L. A. (2013). Momentary assessment of social context and glucose monitoring adherence in adolescents with type 1 diabetes. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine,* 52(5), 578-583.

Bresin, K. (2014). Five indices of emotion regulation in participants with a history of nonsuicidal self-injury: A daily diary study. *Behavior Therapy*, 45, 56–66.

Bresin, K., Carter, D. L. y Gordon, K. H. (2013). The relationship between trait impulsivity, negative affective states, and urge for nonsuicidal self-injury: A daily diary study. *Psychiatry Research*, 205, 227–231.

Broad, K. L., Sandhu, V. K., Sunderji, N. y Charach, A. (2017). Youth experiences of transition from child mental health services to adult mental health services: a qualitative thematic synthesis. *BMC Psychiatry*, *17*(1), 380.

Bromberg, M. H., Connelly, M., Anthony, K. K., Gil, K. M. y Schanberg, L. E. (2014). Self-reported pain and disease symptoms persist in juvenile idiopathic arthritis despite treatment advances: an electronic diary study. *Arthritis & Rheumatology*, 462-469.

Bryden, K.S., Peveler, R. C., Stein, A., Neil, A., Mayou, R. A. y Dunger, D. B. (2001). Clinical and psychological course of diabetes from adolescence to young adulthood: A longitudinal cohort study. *Diabetes Care*, 24, 1536–1540.

Buelens., T, Luyckx, K., Kiekens, G., Gandhi, A., Muehlenkamp, J.J. y Claes, L. (2020). Investigating the DSM-5 criteria for non-suicidal self-injury disorder in a community sample of adolescents. *Journal of Affective Disorders*, 260, 314–22

Bunning, K. (1998). To engage or not to engage? Affecting the interactions of learning disabled adults. *International Journal of Language & Communication Disorders*, 33 Suppl, 386-391.

Cain, A. E., Depp, C. A. y Jeste, D. V. (2009). Ecological Momentary Assessment in Aging Research: A Critical Review. *Journal of psychiatric research*, 43(11).

Cassels, M., Baetens, I., Wilkinson, P., Hoppenbrouwers, K., Wiersema, J. R., Van Leeuwen, K. y Kiekens, G. (2019). Attachment and Non-Suicidal Self-Injury among Young Adolescents: The Indirect Role of Behavioral Problems. *Archives of Suicide Research: Official Journal of the International Academy for Suicide Research*, *23*(4), 688–696.

Ciechanowski, P. S., Katon, W. J., Russo, J. E. y Walker, E. A. (2001). The patient-provider relationship: attachment theory and adherence to treatment in diabetes. *The American Journal of Psychiatry*, 158(1), 29–35.

Cipriano, A., Cella, S. y Cotrufo, P. (2017). Nonsuicidal Self-injury: A Systematic Review. *Frontiers in Psychology*, 8, 1946.

Cleverley, K., Rowland, E., Bennett, K., Jeffs, L. y Gore, D. (2020). Identifying core components and indicators of successful transitions from child to adult mental

health services: a scoping review. *European Child & Adolescent Psychiatry*, 29(2), 107–121.

Cohen, J. y Torous, J. (2019). The Potential of Object-Relations Theory for Improving Engagement With Health Apps. *JAMA*, 322 (22), 2169-2170.

Connelly, M., Bromberg, M. H., Anthony, K. K., Gil, K. M., Franks, L. y Schanberg, L. E. (2012). Emotion regulation predicts pain and functioning in children with juvenile idiopathic arthritis: an electronic diary study. *Journal of Pediatric Psychology*, 37(1), 43-52.

Connelly, M., Miller, T., Gerry, G. y Bickel, J. (2010). Electronic momentary assessment of weather changes as a trigger of headaches in children. *Headache,* 50(5), 779-789.

Cox, L. J., Stanley, B. H., Melhem, N. M., Oquendo, M. A., Birmaher, B., Burke, A., Kolko, D. J., Zelazny, J. M., Mann, J. J., Porta, G. y Brent, D. A. (2012). A longitudinal study of nonsuicidal self-injury in offspring at high risk for mood disorder. T*he Journal of Clinical Psychiatry*, 73(6), 821–828.

Davidson, C.L., Anestis, M.D. y Gutiérrez, P.M. (2017). Ecological momentary assessment is a neglected methodology in suicidology. A*rchives of Suicide Research*. 21 (1), 1–11.

Del Barrio, V., Roa, M. L., Olmedo, M. y Colodron, F. (2002). Primera adaptación del CDI a la población española. *Acción Psicológica*, 3, 263-272.

Del Barrio, V., Spielberger, C. D. y Aluja, A. (2006). *"STAXI-NA. Inventario de Expresión de Ira Estado-Rasgo en niños y adolescentes"*. TEA Ediciones, 1a edición.

Delespaul, P. (1995). *Assessing Schizophrenia in Daily Life: The Experience Sampling Method*. Maastricht Univ. Press, Maastrich.

Díaz de Neira, M. (2014). *Características psicopatológicas, acontecimientos vitales estresantes y conductas autolesivas suicidas y no suicidas en adolescentes evaluados en salud mental.* Universidad Autónoma de Madrid, Madrid.

Dunton, G., Dzubur, E., Li, M., Huh, J., Intille, S. y McConnell, R. (2016). Momentary Assessment of Psychosocial Stressors, Context, and Asthma Symptoms in Hispanic Adolescents. *Behavior Modification*, 40(1-2), 257-280.

Ellison, W. D. (2014). *Using dynamic factor analysis to model intraindividual variation in borderline personality disorder symptoms.* Penn State, US.

Evans, K., Tyrer, P., Catalan, J., Schmidt, U., Davidson, K., Dent, J., Tata, P., Thornton, S., Barber, J. y Thompson, S. (1999). Manual-assisted cognitive-behaviour therapy (MACT): a randomized controlled trial of a brief intervention with bibliotherapy in the treatment of recurrent deliberate self-harm. *Psychological Medicine*, *29*(1), 19-25.

Finkelstein, J., Cabrera, M. R. y Hripcsak, G. (2000). Internet-based home asthma telemonitoring: can patients handle the technology? *Chest,* 117(1), 148-155.

Forbush, K. T. y Hunt, T. K. (2014). Characterization of eating patterns among individuals with eating disorders: what is the state of the plate?. *Physiology & Behavior.* 134, 92–109.

García-Nieto, R., Blasco-Fontecilla, H., Paz Yepes, M. y Baca-García, E. (2013). Translation and validation of the "Self-Injurious Thoughts and Behaviours Interview" in a Spanish population with suicidal behaviour. *Revista de Psiquiatría y Salud Mental* (English Edition), 6(3), 101–108.

García-Nieto, R., Carballo, J. J., Hernando, M. D. de N., León-Martinez, V. de y Baca-García, E. (2015). Clinical Correlates of Non-Suicidal Self-Injury (NSSI) in an Outpatient Sample of Adolescents. *Archives of Suicide Research*, 19(2), 218–230.

Glenn, C. R. y Klonsky, E. D. (2011). Prospective prediction of nonsuicidal self-injury: A 1-year longitudinal study in young adults. *Behavior Therapy*, *42*(4), 751–762.

Glenn, C. R., Lanzillo, E. C., Esposito, E. C., Santee, A. C., Nock, M. K. y Auerbach, R. P. (2017). Examining the Course of Suicidal and Nonsuicidal Self-Injurious Thoughts and Behaviors in Outpatient and Inpatient Adolescents. *Journal of Abnormal Child Psychology*, *45*(5), 971–983.

Grandclerc, S., Labrouhe, D. D., Spodenkiewicz, M., Lachal, J. y Moro, M. R. (2016). Relations between Nonsuicidal Self-Injury and Suicidal Behavior in Adolescence: A Systematic Review. *PLOS ONE*, 11(4).

Groschwitz, R. C., Plener, P. L., Kaess, M., Schumacher, T., Stoehr, R. y Boege, I. (2015). The situation of former adolescent self-injurers as young adults: A follow-up study. *BMC Psychiatry*, *15*.

Gross, J. T., Stern, J. A., Brett, B. E. y Cassidy, J. (2017). The multifaceted nature of prosocial behavior in children: Links with attachment theory and research. *Social Development*, *26*(4), 661–678.

Guy, W. (1976). *ECDEU assessment manual for psychopharmacology*. U.S. Dept. of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute of Mental Health, Psychopharmacology Research Branch, Division of Extramural Research Programs.

Hamza, C. A. y Willoughby, T. (2015). Nonsuicidal self-injury and affect regulation: recent findings from experimental and ecological momentary assessment studies and future directions. *Journal of Clinical Psychology,* 71(6), 561–574.

Hankin, B. L. y Abela, J. R. (2011). Nonsuicidal self-injury in adolescence: prospective rates and risk factors in a 2(1/2) year longitudinal study. *Psychiatry Research,* 186(1), 65-70.

Hasler, G., Hopwood, C. J., Jacob, G. A., Brändle, L. S. y Schulte-Vels, T. (2014). Patient-reported outcomes in borderline personality disorder. *Dialogues in Clinical Neuroscience,*16(2), 255–266.

Hauber, K., Boon, A. y Vermeiren, R. (2019). Non-suicidal Self-Injury in Clinical Practice. *Frontiers in Psychology*, 10: 502.

Hektner, J., Schmidt, J. y Csikszentmihalyi, M. (2006). *Experience Sampling Method: Measuring the Quality of Everyday Life.* Thousand Oaks

Heron, K. E., Everhart, R. S., McHale, S. M. y Smyth, J. M. (2017). Using Mobile-Technology-Based Ecological Momentary Assessment (EMA) Methods With Youth: A Systematic Review and Recommendations. *Journal of Pediatric Psychology*, 42(10), 1087-1107.

Hilt, L., Nock, M., Lloyd-Richardson, E. y Prinstein, M. (2008). Longitudinal study of nonsuicidal self-injury among young adolescents: Rates, correlates and preliminary test of an interpersonal model. *Journal of Early Adolescence,* 28, 455–469.

Hooley, J.M., Fox, K. R. y Boccagno, C. (2020). Nonsuicidal Self-Injury: Diagnostic Challenges And Current Perspectives [Internet]. *Neuropsychiatry Disease and Treatment*,16, 101-112.

Horowitz, S. y Stermac, L. (2017). The relationship between interpersonal trauma history and the functions of non-suicidal self-injury in young adults: an experience sampling study. *Journal of Trauma Dissociation*, 16, 1–15.

Houben, M., Claes, L., Vansteelandt, K., Berens, A., Sleuwaegen, E. y Kuppens, P., (2017). The emotion regulation function of nonsuicidal self-injury: a momentary assessment study in inpatients with borderline personality disorder features. *Journal of Abnormal Psychology,* 126(1), 89–95.

Hufford, M. R., Shields, A. L., Shiffman, S., Paty, J. y Balabanis, M. (2002). Reactivity to ecological momentary assessment: an example using undergraduate problem drinkers. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*, 16(3), 205-211.

Humber, N., Emsley, R., Pratt, D. y Tarrier, N. (2013). Anger as a predictor of psychological distress and self-harm ideation in inmates: a structured self-assessment diary study. *Psychiatry Research*, 210 (1).

Intille, S. (2007). Technological innovations enabling automatic, context-sensitive ecological momentary assessment. En A. Stone et al. (Eds.), *The science of real-time data capture: self-reports in health research.* (pp. 308-337). Oxford University Press.

Kaess, M., Parzer, P., Mattern, M., Plenner, P., Bifulco, A., Resch, F. y Brunner, R. (2013). Adverse childhood experiences and their impact on frequency, severity, and the individual function of nonsuicidal self-injury in youth. *Psychiatry Research*, 206, 265–72.

Khor, A. S., Gray, K. M., Reid, S. C. y Melvin, G. A. (2014). Feasibility and validity of ecological momentary assessment in adolescents with high-functioning autism and Asperger's disorder. *Journal of Adolescence*, 37(1), 37-46.

Klonsky, E. D. (2007). The functions of deliberate self-injury: a review of the evidence. *Clinical Psychology Review,* 27(2), 226–239.

Klonsky, E. D., Victor, S. E. y Saffer, B. Y. (2014). Nonsuicidal Self-Injury: What We Know, and What We Need to Know. *Canadian Journal of Psychiatry*. *Revue Canadienne de Psychiatrie*, *59* (11), 565–568.

Lal, S., y Adair, C. E. (2014). E-Mental Health: A Rapid Review of the Literature. *Psychiatric Services,* 65(1), 24-32.

Lavender, J. M., De Young, K. P., Wonderlich, S. A., Crosby, R. D., Engel, S. G., Mitchell, J. E., Crow, S. J., Peterson, C. B., & Le Grange, D. (2013). Daily patterns of anxiety in anorexia nervosa: associations with eating disorder behaviors in the natural environment. *Journal of Abnormal Psychology*, *122*(3), 672-683.

Lavender, J. M., Wonderlich, S. A., Crosby, R. D., Engel, S. G., Mitchell, J. E., Crow, S. J., Peterson, C. B. y Le Grange, D. (2013). Personality-based subtypes of anorexia nervosa: examining validity and utility using baseline clinical variables and ecological momentary assessment. *Behaviour Research and Therapy,* 51(8), 512-517.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J. y Moher, D. (2009). The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *PLOS Medicine*, 6(7), e1000100

Maas, J., Hietbrink, L., Rinck, M. y Keijsers, G. P. J. (2013). Changing automatic behavior through self-monitoring: Does overt change also imply implicit change? *Journal of Behavior Therapy and Experimental Psychiatry*, *44*(3), 279-284.

Martin, J., Bureau, J.-F., Lafontaine, M.-F., Cloutier, P., Hsiao, C., Pallanca, D. y Meinz, P. (2017). Preoccupied but not dismissing attachment states of mind are associated with nonsuicidal self-injury. *Development and Psychopathology*, *29*(2), 379–388.

Marzocchi, G. M., Capron, C., Di Pietro, M., Duran Tauleria, E., Duyme, M., Frigerio, A., Gaspar, M. F., Hamilton, H., Pithon, G., Simões, A. y Thérond, C. (2004). The

use of the Strengths and Difficulties Questionnaire (SDQ) in Southern European countries. *European Child & Adolescent Psychiatry*, 13(2), ii40-ii46.

McKenzie, K. C. (2014). *Non-suicidal self-injury: An emotion regulation perspective*. ProQuest Information & Learning.

Meany-Daboul, M. G., Roscoe, E. M., Bourret, J. C. y Ahearn, W. H. (2007). A Comparison of Momentary Time Sampling and Partial-Interval Recording for Evaluating Functional Relations. *Journal of Applied Behavior Analysis*, *40*(3), 501-514.

Memon, A. M., Sharma, S. G., Mohite, S. S. y Jain, S. (2018). The role of online social networking on deliberate self-harm and suicidality in adolescents: A systematized review of literature. *Indian Journal of Psychiatry*, 60(4), 384-392.

Miguelez-Fernandez, C., de Leon, S. J., Baltasar-Tello, I., Peñuelas-Calvo, I., Barrigon, M. L., Capdevila, A. S., Delgado-Gómez, D., Baca-García, E. y Carballo, J. J. (2018). Evaluating attention-deficit/hyperactivity disorder using ecological momentary assessment: a systematic review. *Attention Deficit and Hyperactivity Disorders*, 10(4), 247-265.

Mikulincer, M. y Shaver, P. R. (2015). An Attachment Perspective on Prosocial Attitudes and Behavior. *The Oxford Handbook of Prosocial Behavior*.

Morren, M., van Dulmen, S., Ouwerkerk, J. y Bensing, J. (2009). Compliance with momentary pain measurement using electronic diaries: a systematic review. *European Journal of Pain*, 13(4), 354-365.

Muehlenkamp, J., Brausch, A., Quigley, K. y Whitlock, J. (2013). Interpersonal features and functions of nonsuicidal self-injury. *Suicide & Life-Threatening Behavior*, 43(1), 67-80.

Muehlenkamp, J. J., Engel, S. G., Wadeson, A., Crosby, R. D., Wonderlich, S. A., Simonich, H. y Mitchell, J. E. (2009). Emotional states preceding and following acts of non-suicidal self-injury in bulimia nervosa patients. *Behaviour Research and Therapy*, 47(1), 83-87.

Muehlenkamp, J. J. y Gutierrez, P. M. (2007). Risk for suicide attempts among adolescents who engage in non-suicidal self-injury. *Archives of Suicide Research*. 11(1), 69–82.

Murray, J., Menezes, A. M. B., Hickman, M., Maughan, B., Gallo, E. A. G., Matijasevich, A., Gonçalves, H., Anselmi, L., Assunção, M. C. F., Barros, F. C. y Victora, C. G. (2015). Childhood behaviour problems predict crime and violence in late adolescence: Brazilian and British birth cohort studies. *Social Psychiatry and Psychiatric Epidemiology*, *50*(4), 579–589.

Myin-Germeys, I., Birchwood, M. y Kwapil, T. (2011). From environment to therapy in psychosis: a real-world momentary assessment approach. *Schizophrenia Bulletin*, 37(2), 244-247.

Nock, M.K. (2008). Actions speak louder than words: An elaborated theoretical model of the social functions of self-injury and other harmful behaviors. *Applied and Preventive Psychology*, 12, 159–168.

Nock, M.K. (2010). Self-injury. *Annual Review of Clinical Psychology*, 6, 339-363.

Nock, M. K. y Favazza, A. R. (2009). Nonsuicidal self-injury: Definition and classification. In *Understanding nonsuicidal self-injury: Origins, assessment, and treatment* (pp. 9–18). American Psychological Association.

Nock, M. K., Joiner, T. E., Gordon, K. H., Lloyd-Richardson, E. y Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: diagnostic correlates and relation to suicide attempts. *Psychiatry Research*, 144(1), 65-72.

Nock, M. K., Prinstein, M. J. y Sterba, S. K. (2009). Revealing the form and function of self-injurious thoughts and behaviors: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology*, 118(4), 816–827.

O'Connor, S. G., Koprowski, C., Dzubur, E., Leventhal, A. M., Huh, J. y Dunton, G. F. (2017). Differences in Mothers' and Children's Dietary Intake during Physical and Sedentary Activities: An Ecological Momentary Assessment Study. *Journal of the Academy of Nutrition and Dietetics*, 117(8), 1265-1271.

Ogundele, M.O. (2018). Behavioural and emotional disorders in childhood: A brief overview for paediatricians. *World Journal of Clinical Pediatrics*. 7(1), 9–26.

Olfson, M., Gameroff, M., Marcus, S., Greenberg, T. y Shaffer, D. (2005). National Trends in Hospitalization of Youth With Intentional Self-Inflicted Injuries. *American Journal of Psychiatry*, 162(7),1328-1335.

Ougrin, D. (2012). Practitioner review: Self-harm in adolescents. *Journal of Child Psychology and Psychiatry*,53(4), 337-50.

Özcan, N. K., Bilgin, H., Akın, M. y Badırgalı Boyacıoğlu, N. E. (2015). Nurses' attitudes towards professional containment methods used in psychiatric wards and perceptions of aggression in Turkey. *Journal of Clinical Nursing*, 24(19-20), 2881-2889.

Pai, A.L.H. y Ostendorf, H. M. (2011). Treatment adherence in adolescents and young adults affected by chronic illness during the health care transition from pediatric to adult health care: A literature review. *Journal of Child Health Care*, 40(1), 16–33.

Pardini, D. A., Byrd, A. L., Hawes, S. W. y Docherty, M. (2018). Unique Dispositional Precursors to Early-Onset Conduct Problems and Criminal Offending in Adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry*, 57(8), 583–592.e3.

Pearson, C. M., Pisetsky, E. M., Goldschmidt, A. B., Lavender, J. M., Wonderlich, S. A., Crosby, R. D., Engel, S. G., Mitchell, J. E., Crow, S. J. y Peterson, C. B. (2016). Personality psychopathology differentiates risky behaviors among women with bulimia nervosa. *International Journal of Eating Disorders*, 49 (7), 681-688.

Peeters, F., Berkhof, J., Delespaul, P., Rottenberg, J. y Nicolson, N. A. (2006). Diurnal mood variation in major depressive disorder. *Emotion*, 6(3), 383-391.

Prinstein, M. J., Heilbron, N., Guerry, J. D., Franklin, J. C., Rancourt, D., Simon, V. y Spirito, A. (2010). Peer influence and nonsuicidal self injury: Longitudinal results in community and clinically-referred adolescent samples. *Journal of Abnormal Child Psychology*, 38(5), 669–682.

Putnam, K. M. y McSweeney, L. B. (2008). Depressive symptoms and baseline prefrontal EEG alpha activity: a study utilizing Ecological Momentary Assessment. *Biological Psychology*, 77(2), 237-240.

Reis, H. T. y Gable, S. L. (2000). Event-sampling and other methods for studying everyday experience. En *Handbook of research methods in social and personality psychology* (pp. 190-222). Cambridge University Press.

Rickwood, D., Webb, M., Kennedy, V. y Telford, N. (2016). Who Are the Young People Choosing Web-based Mental Health Support? Findings From the Implementation of Australia's National Web-based Youth Mental Health Service, eheadspace. *JMIR Mental Health*, 3(3), e40.

Rodríguez-Blanco, L., Carballo, J. J. y Baca-García, E. (2018). Use of Ecological Momentary Assessment (EMA) in Non-Suicidal Self-Injury (NSSI): A systematic review. *Psychiatry Research*, 263, 212-219.

Rosen, P. J., Epstein, J. N. y Van Orden, G. (2013). I know it when I quantify it: ecological momentary assessment and recurrence quantification analysis of emotion dysregulation in children with ADHD. *Attention Deficit and Hyperactivity Disorders,* 5(3), 283-294.

Sánchez-López, M. del P. y Dresch, V. (2008). The 12-Item General Health Questionnaire (GHQ-12): reliability, external validity and factor structure in the Spanish population. *Psicothema*, 20(4), 839-843.

Santangelo, P. S., Koenig, J., Funke, V., Parzer, P., Resch, F., Ebner-Priemer, U. W. y Kaess, M. (2016). Ecological Momentary Assessment of Affective and

Interpersonal Instability in Adolescent Non-Suicidal Self-Injury. *Journal of Abnormal Child Psychology,* 45(7), 1429-1438.

Satterfield, J. H., Faller, K. J., Crinella, F. M., Schell, A. M., Swanson, J. M. y Homer, L. D. (2007). A 30-year prospective follow-up study of hyperactive boys with conduct problems: adult criminality. *Journal of the American Academy of Child and Adolescent Psychiatry*, 46(5), 601–610.

Shaffer, D., Gould, M. S., Brasic, J., Ambrosini, P., Fisher, P., Bird, H. y Aluwahlia, S. (1983). A children's global assessment scale (CGAS). *Archives of General Psychiatry,* 40(11), 1228-1231.

Shiffman, S (2007). Designing protocols for ecological momentary assessment. En: AA. Stone, S. Shiffman, A. Atienza y A. Nebeling (Eds). *The science of real-time data capture: Self-reports in health research.* (pp. 27–53). Oxford University Press.

Shiffman, S. (2009). Ecological momentary assessment (EMA) in studies of substance use. *Psychological Assessment,* 21 (4), 486–497.

Shiffman, S. (2014). Conceptualizing analyses of ecological momentary assessment data. *Nicotine & Tobacco Research,*16 (Suppl 2), S76–S87.

Shiffman, S., Stone, A. A. y Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology*, 4, 1-32.

Shingleton, R. M., Eddy, K. T., Keshaviah, A., Franko, D. L., Swanson, S. A., Yu, J. S., Krishna, M., Nock, M.K y Herzog, D. B. (2013). Binge/purge thoughts in nonsuicidal self-injurious adolescents: an ecological momentary analysis. *International Journal of Eating Disorders*, 46(7), 684–9.

Stinson, J. N., Jibb, L. A., Nguyen, C., Nathan, P. C., Maloney, A. M., Dupuis, L. L., Gerstle, J. T., Alman, B., Hopyan, S., Strahlendorf, C., Portwine, C., Johnston, D. L. y Orr, M. (2013). Development and testing of a multidimensional iPhone pain assessment application for adolescents with cancer. *Journal of Medical Internet Research*, 15(3), e51.

Stone, A. A., Shiffman, S., Schwartz, J. E., Broderick, J. E. y Hufford, M. R. (2003). Patient compliance with paper and electronic diaries. *Controlled Clinical Trials*, 24(2), 182-199.

Swannell, S. V., Martin, G. E., Page, A., Hasking, P. y St John, N. J. (2014). Prevalence of nonsuicidal self-injury in nonclinical samples: systematic review, meta-analysis and meta-regression. *Suicide & Life-Threatening Behavior*, 44(3), 273-303.

Swendsen, J., Ben-Zeev, D. y Granholm, E. (2011). Real-time electronic ambulatory monitoring of substance use and symptom expression in schizophrenia. T*he American Journal of Psychiatry*, 168(2), 202-209.

Tatnell, R., Kelada, L., Hasking, P. y Martin, G. (2014). Longitudinal analysis of adolescent NSSI: the role of intrapersonal and interpersonal factors. *Journal of Abnormal Child Psychology*, 42(6), 885–896.

Timlin, U., Hakko, H., Heino, R. y Kyngäs, H. (2015). Factors that Affect Adolescent Adherence to Mental Health and Psychiatric Treatment: a Systematic Integrative Review of the Literature. *Scandinavian Journal of Child and Adolescent Psychiatry and Psychology*, 3(2), 99–107.

Turner, B. J., Cobb, R. J., Gratz, K. L. y Chapman, A. L. (2016a). The role of interpersonal conflict and perceived social support in nonsuicidal self-injury in daily life. *Journal of Abnormal Psychology*, 125(4), 588-598.

Turner, B. J., Yiu, A., Claes, L., Muehlenkamp, J. J. y Chapman, A. L. (2016b). Occurrence and co-occurrence of nonsuicidal self-injury and disordered eating in a daily diary study: Which behavior, when? *Psychiatry Research*, *246*, 39-47.

Turner, B. J., Wakefield, M. A., Gratz, K. L. y Chapman, A. L. (2017). Characterizing Interpersonal Difficulties Among Young Adults Who Engage in Nonsuicidal Self-Injury Using a Daily Diary. *Behavior Therapy*, *48*(3), 366-379.

Van den Brink, M., Bandell-Hoekstra, E. N. y Abu-Saad, H. H. (2001). The occurrence of recall bias in pediatric headache: a comparison of questionnaire and diary data. *Headache*, 41(1), 11-20.

Vansteelandt, K., Houben, M., Claes, L., Berens, A., Sleuwaegen, E., Sienaert, P. y Kuppens, P. (2017). The affect stabilization function of nonsuicidal self-injury in Borderline Personality Disorder: An Ecological Momentary Assessment study. *Behaviour Research and Therapy*, 92, 41–50.

Victor, S. E. y Klonsky, E. D. (2014). Daily emotion in non-suicidal self-injury. *Journal of Clinical Psychology*, 70, 364–375.

Walz, L. C., Nauta, M. H. y Aan Het Rot, M. (2014). Experience sampling and ecological momentary assessment for studying the daily lives of patients with anxiety disorders: a systematic review. *Journal of Anxiety Disorders,* 28(8), 925–937.

Wen, C. K. F., Schneider, S., Stone, A. A., y Spruijt-Metz, D. (2017). Compliance With Mobile Ecological Momentary Assessment Protocols in Children and Adolescents: A Systematic Review and Meta-Analysis. *Journal of Medical Internet Research*, 19(4), e132.

Whalen, C. K., Jamner, L. D., Henker, B., Delfino, R. J. y Lozano, J. M. (2002). The ADHD Spectrum and Everyday Life: Experience Sampling of Adolescent Moods, Activities, Smoking, and Drinking. *Child Development*, 73(1), 209-227. JSTOR.

Whitlock, J., Eckenrode, J. y Silverman, D. (2006). Self-injurious behaviors in a college population. *Pediatrics*, *117*(6), 1939–1948.

Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Baral Abrams, G., Barreira, P. y Kress, V. (2013). Nonsuicidal self-injury as a gateway to suicide in young adults. *The Journal of Adolescent Health,* 52(4), 486-492.

Whitlock, J. y Selekman, M. D. (2014). Nonsuicidal Self-Injury Across the Life Span. *The Oxford Handbook of Suicide and Self-Injury*.

Wichstrøm, L. (2009). Predictors of non-suicidal self-injury versus attempted suicide: similar or different? *Archives of Suicide Research*, 13(2), 105–122.

Wilkinson, P., Kelvin, R., Roberts, C., Dubicka, B. y Goodyer, I. (2011). Clinical and psychosocial predictors of suicide attempts and nonsuicidal self-injury in the Adolescent Depression Antidepressants and Psychotherapy Trial (ADAPT). *American Journal of Psychiatry*, 168(5), 495-501.

World Health Organization (1992). *Tenth Revision of the International Classification of Diseases and Related Health Problems (ICD-10)*. WHO

Wright, A. G. C., Hallquist, M. N., Stepp, S. D., Scott, L. N., Beeney, J. E., Lazarus, S. A. y Pilkonis, P. A. (2016). Modeling heterogeneity in momentary interpersonal and affective dynamic processes in borderline personality disorder. *Assessment*, *23*(4), 484-495.

Zaki, L. F., Coifman, K. G., Rafaeli, E., Berenson, K. R. y Downey, G. (2013). Emotion differentiation as a protective factor against nonsuicidal self-injury in borderline personality disorder. *Behavior Therapy*, 44, 529–540.